SYSTEMATIC

SMALL FARMING.

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PREFACE.

The basis of the present volume is a former one, which appeared some years ago under the title of "The Lessons of My Farm." That work was designed to convey to persons interested especially in the subject of small—or as they were frequently termed, amateur farms—a general, yet a sufficiently practical notion of what the work of such farms was.

This was all the more likely to be, if not more interesting, certainly more suggestively useful, from the fact that the volume was mainly the record of work done, and experience gained by the practical conduct of a small farm, on which the Author spent, if not the most useful, assuredly one of the most pleasant periods of a life which has had many pleasant periods to record and to be grateful for. It was, indeed, the pleasure which the Author derived from the care and cultivation of his "little farm" which led him to embody what he had learned on it in a volume which might induce some to take up what is certainly a healthy hobby, and might also be of some service to them in the realisation of all its pleasures.

At the same time it is only right to state that the volume had a more directly practical aim, namely, the

giving of as much and as varied information as possible on the science and the practice of farming generally. And this the Author was enabled to do, inasmuch as he did not go to his little farm altogether ignorant of what farming, in its twofold aspect of a science and an art, was. One of the departments of his professional practice gave him many opportunities of knowing much about land, how it is laid out, and how cultivated, and conferred upon him the acquaintance, and in more cases than one the friendship, of assuredly the most eminent of the then living authorities on the science and practice of agriculture.

"The Lessons of My Farm" possessed a wider scope, and aimed at a more general and practical utility than that which would have been its characteristic had it been a book for popular reading on a popular subject only. And it has been one of the gratifications of the Author's life to know that the volume was found useful by and suggestive to those who were actually engaged in the business of agriculture—those who farmed to live and lived to farm.

A new edition of the work having been called for, it was deemed desirable to utilise the opportunity by enlarging considerably its scope and scheme, so that these should embrace a more directly practical series of remarks, useful to a much wider class.

While this has been done by the addition of new sections and a greater number of illustrations, it is only right to state that nearly the whole of the matter has been retained which originally appeared in the earlier work, much of which, as has been already said, was of

a popular nature, calculated to interest many who were not actually engaged in the business, but who loved to read about the work and might be looking forward to the time when they might share in the pleasure of amateur farming.

As befits its new title and wider scope, the volume has some chapters devoted to the consideration of the general subject of small farms. This discussion has been undertaken, not merely because the question has for some time been engrossing the attention of a large part of the public, or because the Author has resolved to do to the best of his ability what he has endeavoured to perform, namely, putting the real facts of the question before the reader, and helping him to come to a common-sense and therefore safe conclusion as to its important issues from a national point of view; but because its points bear in a most direct and most practical way on the work of small farms, showing the character of that work, and what it demands on the part of those who desire to push it on to a successful issue.

To aid him in putting before the reader the chief facts connected with the subject of Small Farming, the Author has taken the benefit of frequent and of somewhat long continued practical observation of and connection with the work of small farms, not only in this country, but on the Continent, and also, though to a more limited extent, in the United States of America.

While all the sections of the original work have been revised, altered, or added to, so as to bring them up to the latest date, wholly new sections have been given. Of these, perhaps, the most important needs only to

be named here, namely, that which deals with the subject of Ensilage. This is treated of from a directly practical point of view. Practicalness may indeed be said to be the feature of the work which, if it has not been attained as the Author would wish, has certainly been closely aimed at.

The Author will be abundantly repaid for what little trouble has been thrown upon him if the reader should be able to derive as much practical profit as he himself has derived pleasure in the preparation of the following pages. None the less will be his pleasure if he should hereafter learn that something in these pages has induced some of those possessed of ample time and abundant means to try to find out what are the healthy and, in more ways than one, delightful pleasures of SMALL OR AMATEUR FARMING.

OAK LEA, NEAR STOCKPORT, CHESHIRE,
November 26th, 1885.

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SYSTEMATIC
SMALL FARMING.

CHAPTER I.

INTRODUCTORY.

Universal, almost, is the desire to know something about farming, and delightful dreams of some future and happy day when they may tread the flowers of their own fields, come pleasantly alike to the rich citizens in "populous city pent," and the well-to-do artisans who spend their days "amid the tainted air and chaos of eternal smoke."

We are essentially a country-loving people. In the prince, as well as in the peasant, the love of green fields and smiling skies is strongly developed; and it is the ambition of nearly all to have, at some period of their lives, if not the fortune to possess, at least the pleasure to take and farm, land.

Farms fitted for the occupation of amateur agriculturists are necessarily but limited in extent; indeed, in these days, when gigantic "holdings" have swallowed up the little ones, as Aaron's rod swallowed up the rods of the Egyptian sorcerers, they are scarcely entitled to be called farms at all. They are at best but places fitted for carrying out experiments, affording exercise-ground, for showing off the paces of a favourite hobby, or for deriving pleasure or health therefrom; not at all capable of yielding a living, where the work has to be done—as ours has—by men who consume in the shape of wages no small portion of the proceeds of their daily

toil. Such little farms nevertheless afford to the amateur a never-ending series of delights, and much practically useful information. The fields, as he rambles through them, may not only minister to his health, but may teach him lessons in connection with the most interesting of arts worth remembering; and worth paying for, too, even if he does so in the shape of a high rent, or of experiments which are made only to be registered in the list of "farm failures." There is, moreover, a positive pleasure, worth paying even somewhat dearly for, in raising one's own produce. As one cracks, at the breakfast-table, the eggs laid by the hens of the farm, spreads the bread with the butter, or enriches the coffee with the cream, obtained from the milk of the cow, one is very apt to think that it is somewhat better than eating stale eggs at high prices, or using butter or milk not always good, and always dear.

Of course all this pleasure is to be paid for, and, as we have already hinted, paid for at a somewhat high rate. For we are much of the opinion, that while pleasures of no ordinary kind are derivable from the possession of a "play-farm," profits of the highly satisfactory golden-coloured kind, so much written about lately, are not quite so easily extracted from them. The fields of the amateur's farm are somehow or other more remarkable for their absorptive than their productive qualities. If amateur farming, then, has its delights, it is but right to say, at the outset, that it frequently has its losses also. And on this point, the reader making up his mind to "play at farming," as some one has kindly designated the efforts of amateurs, must also make up his mind to stand no small amount of sly innuendoes, if not more open jeers; for it is surprising the delight which non-amateurs take in giving one sly pokes on this tender point. In short, if amateur farming is taken up only with the view of making money by it, it had better be let alone. For as the work of the amateur farm must be done in nine cases out of ten by hired labour, little profit will result. Let it then satisfy the amateur farmer if he makes ends meet; and do not

even let him grumble if he pays some ten or twenty pounds a-year more for his farm than he would do otherwise for a house alone. The truth is, that the health derivable, and the pleasures, also, from the fields of a pet farm are worth a good deal. Men *will* spend money some way, and I know none more productive of real satisfaction—moral as well as physical—than farming a "wee bit of land." Putting all things together, amateur farming does pay, though not always in the pecuniary sense.

There are, of course, two ways of proceeding even in amateur farming, the right and the wrong one; and if the right way is followed, the natural result is, that the losses too often met with are reduced; a satisfactory result, to say the least of it. But how to know the right way is the difficulty with many of those who contemplate amateur farming more for the sake of the health and the pleasure than the profit it brings them. They may be ignorant, to a great extent, of the practice of farming, and are therefore naturally anxious to know, not only *what* to do, but *how* to do it. Further, ignorant also, as they possibly are, of the science of agriculture, they may be desirous to know somewhat of the principles on which its correct practice is founded.

To act as a guide in all or most of these directions is the object of this little volume. While much of it is taken up by detailing the mode of working we have adopted on our own little "play-farm," it has been our desire to aid the reader in his practice by explaining, as fully as its limits will allow, the principles and practice generally of modern agriculture; and further to detail the various experiments, the results of which are now interesting that portion of the practical agricultural world who live to farm and farm to live. Presenting thus a variety of directions in which he may proceed, and of objects with which he may interest himself, it will be for the amateur reader to choose for himself which of these directions he will follow, and with which of the objects he will interest

himself. Our object will be attained if we be fortunate enough to show the reader how, by a variety of simple expedients, he may add to the interest and pleasure of his farm, and, in some measure, to its economical working.

Such, and so far only, was the aim of this work when it appeared in its first edition. Then it was a work addressing itself to the amateur farmer; but while it is still this much, it is now, in its present form, more. For on a due consideration of all the circumstances in which farming now is, and of others which we may fairly conjecture will in the future come to be, important factors in the problem how to make the best of farming land, it has been deemed right that some portion of the work should be addressed specially to those who, cultivating or likely to cultivate areas of but limited extent as a means of livelihood, are known as small farmers. At the same time it is but proper to state that much of the matter which was designed especially for amateur farmers is still applicable to this class of small farmers; while the opposite is equally true, that what is now given of a more directly practical and more fully detailed character for the benefit of the small farmer who farms for the purpose of gaining a livelihood, will be found equally suitable to the amateur who farms only for the pleasure of the thing or for the improvement of his health.

But that many of the class of those who take up small farming as a business, with a view to gain the maximum of profit with the minimum of labour and cash outlay, find in that which attracts them to it a large element in the love of a rural life, there is not the smallest doubt. This may not be the popular view of the matter, nor do we say that the feeling is held by small farmers as a rule; but, from experience of the subject, we can aver that not a few in whose outer life there seems to be but little expression of the higher and more cultivated ends, find as much pleasure in the work and have as keen a zest for all its labours, as

many an amateur, who devotes no little of his time and much of his money to what is called the "love of the thing." And assuredly, in the case of the small farmer who works to live, it may be said that if he has this "love" of rural work, he will have all the better chance of making a good living out of it. For this wonderfully lightens labour, and tends greatly to make what in others would be the meanest drudgery a labour of love. And beyond all doubt rural life is capable of yielding a very large amount of intellectual pleasure, and has charms amidst all its prosaic pursuits which, if rightly looked at and availed of, go greatly to make those pursuits more easily followed and their necessary burdens lighter to bear.

Of the ever new and ever changing pleasures of a country life, we know of none indeed so delightful as rambling through your own fields—tiny as they may be thought by the big farmer of the day—watching the progress of the crops which they bear, or sharing in the labour by which these are made to be productive. Even in dreary winter-time the pleasure is not small, for as you stride sharply over the clods which the frost has bound into hardened lumps, and which, under the balmy breezes of spring will crumble into the fine tilth, delighting the farmer's eye; or, as you walk through the grass, or skirt the hedgerows, every blade and branch of which is silver frosted with the most delicate of tracery, you feel it to have been worth while to have left the cozy comfort of your fireside for the pleasure the walk has given you. But it is in the pleasant spring-time that your heart is gladdened and your eye delighted with the thousand sights and sounds around you; when, with the springing plant, the humming of countless insects, or the music of the flitting bird, you feel the gladness of a new life, and, if your mind is healthy, that gratitude, too, to Him who has made the world such a place of beauty, and who has given you health to enjoy the pure pleasures with which He, let some say what they will to the contrary, has filled its paths. The very air you breathe rejoices you, and

there is a softness in it, the nature of which, if asked, you could not explain, but which you know to belong specially to pleasant and cheery spring-time, which summer, with all her gorgeous beauties, can lay no claim to, and autumn cannot boast of.

But the pleasures of your field rambles will be enhanced a thousand-fold if you take an interest in the progress of the plants which they bear. We know, indeed, no feeling so peculiarly pleasant as that arising from a close watching of the growth of plants, the seeds of which you have laid in or scattered over the soil with your own hands, or seen done by others. When you place them in the bosom of old mother earth, you wonder the while as to the results of your labours, and look forward through a long vista of sunny and showery days to the harvest-time, when these labours will be repaid. After a while you return and see here and there a green bud bursting through, till by and by lines of green variegate the brown surface of the soil. Day after day you visit the plots, detecting the effect of untimely frosts and biting blasts, rejoicing in every evidence of healthy and vigorous life, till at last you begin to build up an affection for the object of your labour and care, the nature and the depth of which you would scarcely like to own to any one, but of which, nevertheless, if you are a true man, you must not in any way or anywhere be ashamed. Watching their progress thus, from the first tender shoot which you see bursting through the clod, to their development in the golden grain or the juicy root, you can share somewhat in the enthusiasm which prompted one of the brightest ornaments of agricultural science to say to us one well-remembered day, while descanting on the pleasures of farming, "Agriculture is the noblest of all pursuits; the farmer, sir, is a creator."

Nothing is so generous as the soil; nothing repays with such liberal profusion the labour you bestow upon it. You give her of scanty measure, and she flings back to you from her swelling bosom a thousand-fold, till your barns burst with plenty. We could go on

long enough dilating upon the pleasures of a country life till we could communicate to those of our readers who have none, some of the enthusiasm which we are free to confess we feel for a pursuit the oldest and most honourable of all, and of which the pleasures never pall. But we fear that some will deem this an intrusion upon the space which should be devoted to more practical, if not prosaic, details connected with the doings on our farm, and to the consideration of which we now proceed.

CHAPTER II.

BRIEF GLANCE AT THE PECULIAR CHARACTERISTICS OF MODERN FARMING.—THE CIRCUMSTANCES WHICH LED TO THE ESTABLISHMENT OF SCIENTIFIC AGRICULTURE.—ITS INFLUENCE ON, AND THE RAPID PROGRESS IT CREATED IN, THE ART OF FARMING.

THE more thoroughly the details of the agricultural progress made during the last half-century are examined and understood, the more completely will one striking feature be observed—namely, the extent, as well as the diversity, of the operations of modern, or what may be called scientific, farming. This feature is all the more marked to one who is acquainted with the details of farming as it was practised, say, fifty years ago, by the body of farmers as a class; and is still, we regret to say, carried on by farmers in some districts, who have not allowed themselves to be influenced by the many causes which have made modern farming in its best aspects the comparatively perfect art it now is in the hands of so many, probably the majority, of farmers who are now engaged in it. The old style of farming universally practised some half-century ago—taking that as the starting period of a new line of departure, although we might in some few instances put it farther back, as in many more we might bring it more forward—was distinguished by the extreme simplicity of its operations, and by the small number of the helps and appliances which could be brought to aid them. Ploughing, harrowing, and rolling—and of these three the last could not be, nor was, always in use—indeed constituted the three operations of farming, so far as the cultivation of crops was concerned. The implements by which these operations were carried

out were comprised in the plough, the harrow, and the roller, and those as rude and rough in design and construction as they were few in number. Of machines, properly so called, the turnip-slicer and the threshing-machine were the only representatives, the latter having place only in the best farms, conducted by men of some capital, its place being taken in the great majority of farms by the flail. Of agricultural science, as the term is now widely understood and its lessons so extensively adopted, there was then literally none. No doubt it had a place, after a feeble fashion, in books and occasional papers, which found their way into the transactions of the few agricultural societies, and the still fewer journals devoted to or interested in farming, then existing. But that union, now so strong and so widely represented in all districts of the kingdom, which is so prominent in the motto of the Royal Agricultural Society of England, "Practice *with* Science," did not practically exist. The science of manuring, such as it was shadowed forth—this expression is the only one applicable here—in a few books and papers, had no place amongst the helps which the farmer could look to. Farmyard dung, or "muck," as it was not very nicely named by many, was the only manure then used, auxiliary or artificial manures being practically unknown. And this farmyard manure was used in a thoroughly rough and speculative way, little or no attention being paid to making the most of it, either by its treatment before it was added to the soil, or by the methods by which it was applied to it. So far as cattle and sheep were concerned, while farmers such as Bakwell, Colling, and Booth, more by observation than by a knowledge of physiology, established most valuable "breeds," the science of cattle foods and of feeding had literally no existence. The only foods known, at least used practically, were grass and turnips, straw and hay, and what constituted their true feeding value was not even guessed at; and what is now used so extensively as artificial foods, or, more generally, "cattle foods," were practically unknown.

But all this is now completely changed since the introduction of the new era in agricultural history. When practice became combined with science, in every department the benefits of this happy union were shown; a more accurate knowledge of soils was obtained, and the relation which these bore to the crops, and both of these to the manures employed, much more definitely ascertained. This gave a power to the farmer of which his predecessors had never dreamed, and its influence was made clearly evident not merely by the higher results obtained in practice, but by the more definite assurance the farmer had that by certain methods of treatment his land and its crops would yield with greater or less precision certain results. And those methods almost necessitated a wider range, and a higher state in the working efficiency of the mechanical appliances by which he could prepare his soil and clear and weed the crops than the old method of working had required. The implements and machines of the farm were thus multiplied to a great extent, and gave rise to a trade known as that of agricultural implement making, which demanded establishments or factories so large, and employed "hands" so numerous, that the business soon assumed an importance second almost to none. The same activity of scientific research and discovery and of business enterprise characterized the other departments of farming. In manures the chemist, by his work in the laboratory and his experiments in the field, gave to the farmers a very much wider range of fertilising substances for his crops than had been anticipated by even the most sanguine of scientists. And the supply of these in weight and bulk sufficient to meet the requirements of farmers, who soon became alive to their value as helping them, with an approach to definite certainty of results, to increase the quality as well as the quantity of their crop produce, gave rise to an enormous trade in the making of artificial manures. And with their rapid improvement in the treatment of soils, crops, and manures came a progress no less remarkable in connection with the animals of the farm.

Almost, if not quite, coincident with the researches and discoveries of men of science in connection with those three departments, came those connected with the science of cattle feeding, thus involving, of course, researches into the nature of different kinds of food. And as in the department of manures the one kind or class of natural manure which alone the farmer had once at his command was supplemented by numbers of artificial manures, so in the work of feeding his cattle the limited range of foods he had in the old practice was at last increased to a very wide one by the introduction and manufacture on the largest commercial scale of artificial foods.

We do not say that the change from the old style of farming, which we have seen to have been of the most limited character in resources and the range and produce of its work, to the new system with its enormously increased range of resources and knowledge, was universal. Neither was it immediately brought about. Yet, as compared with the advance in the practice of other industrial callings, dependent on the influence of a higher range of knowledge, that of farming is well entitled to boast of having shown a remarkable readiness to avail itself of the recent discoveries of science as applicable to its practice. It may, indeed, well be doubted whether any branch of our national industrial work made strides so rapid and so wide as did farming. One thing was, however, soon made clear by this new era of agricultural history. And this was that henceforth, if the improvements in the practice of farming were to be continued, and if possible increased in number and in value, not merely capital would be required, but intelligence in applying all the helps science afforded, and all those higher business and personal qualifications which are demanded, wherever a calling is one which requires knowledge or ability to design or arrange, as well as skill to execute. The old-style farmer might do his best with what helps he could obtain from his rule-of-thumb practice and the limited range of his materials ; but that at best would give but

a poor return, when the extent and the quality of his soil were considered, in relation to a higher and more advanced system of working. But, as we have said, the higher and more advanced, or, in other words, the new style of farming, in which the advancement of science was availed of in practice, demanded not merely capital, but an altogether different, because infinitely higher, range of business and personal qualifications than would satisfy the requirements of farming on the old "rule-of-*thumb system*."

CHAPTER III.

ON VARIOUS POINTS CONNECTED WITH SMALL FARMS.—THE CHARACTER OF THE LABOUR THEIR CULTIVATION DEMANDS.—THE PROSPECTS THEY AFFORD OF YIELDING A FAIR RETURN FOR THE CAPITAL THEY REQUIRE FOR WORKING THEM WELL, OR OF GIVING A COMFORTABLE LIVELIHOOD FOR THE LABOUR THEY DEMAND.

A FAIRLY exhaustive, certainly a practical, consideration of the leading points mentioned in the title of the present chapter is clearly demanded of us. And this, not merely because the scope of our work is very materially altered and its scheme enlarged by taking in a wider class of readers—those who farm to live and live to farm—but because the whole question has now advanced to such a position in public estimation, and is now advocated by many upon grounds which demand in public interests the gravest of consideration and the most honest investigation. For beyond all doubt the points involved in the position which some take up in the matter, possess the most vital interest from a social point of view. The question of the wide—and as some advocate the widest possible—extension of a system of small farming or peasant husbandry, has more than once in our national history been widely, and we may say very wildly, discussed. But such extreme agitations have died out without making much impression on the public mind. Of late, and it would be more correct to say very recently, the subject has been again revived, and its points discussed by those who, having more influence than those concerned in the old controversies, are likely to impart their views to the public in a more telling way than has yet been done. In view of this, as well as in the interests of such of our readers

as may either be disposed to advance, and possibly to materially assist, those engaged in small farming or peasant husbandry, or who themselves belong to the class of working men, from whose ranks small farmers are likely to be recruited, we deem it absolutely essential to inquire, as fully as may be, what really are the characteristics of small farm work, and what the prospects of those who take to it as a means of gaining a comfortable livelihood, and one which does not demand more than the usual extent of hard work.

In looking back at a period of a few years ago, it will be seen that, so far as the general public was concerned, the question of small farms occupied but a small part of their interest. It was, indeed, a topic which was but seldom heard, still less frequently discussed, in any way approaching to that in which a question is considered to which the term "popular" is attached. If heard of at all it was only in very limited circles, and as one which took the position of the personal whim or hobby of some rich merchant or man of business, who to his residence in the country took the fancy to add the expenses, in the hope of obtaining some of the pleasures, of "keeping a little farm." But as a question which had a pretension to be possessed of national interest, that of small farms had positively no position.

Matters, however, as we have just alluded to, have assumed in relation to it a totally different aspect of late. For some few years back the public mind has been agitated, whether healthily and usefully or otherwise it is not within our present purpose to say, by a series of discussions so intimately connected with the "land question," that that of small farms has taken a position which has compelled, so to say, the public to direct their attention to it. So marked, indeed, was the influence of this public discussion, and such the position or character of the legislative enactments which formed its basis, that in place of the small-farms question being a subordinate or incidental feature of the general subject, it became, on the contrary, the leading cha-

racteristic of the discussion to which that subject had given rise.

It thus came about that for a long series of months the public mind, through the media of press and platform utterances, was super-saturated, so to express it, with matter on the subject of small farms or peasant husbandry. And as seems to be the inevitable concomitant when any subject, no matter what, takes a hold on the public mind, the information given and the counsel offered are distinguished at times much more by their affluence and energy than by the accuracy of the evidence on which that information should have been based, and the common-sense, business-like prudence with which that counsel should have been offered to the public. And so it was that in this discussion, as in all other public discussions distinguished by the like characteristic of public earnestness, it could with perfect accuracy have been said, that more good would have resulted had less been uttered. And this from the fact, which seems to be an inevitable concomitant of all public questions widely discussed, that many took part in it with an almost, in some cases a perfectly, absolute ignorance of the true conditions of the question. So that one result of this widespread public discussion was, to quote the words of one who really knew its true elements, and who was in more senses than one a "trustworthy authority" in all matters agricultural, "that so much nonsense had been talked, and so many absurd positions had been taken up on platforms and through the press on the subject of small farms, that it would take long to undo the mischief which had arisen and would yet arise from it."

Like every question which for a time greatly agitates the public mind, this special discussion has been supplanted and replaced by other "farming questions," which have been in turn more than warmly—hotly—discussed, and in turn given place to others treated in a way equally ardent. Still the whole subject of small farms is essentially one in which the welfare of the nation is concerned, and one the interest of which

in the public mind is not likely to die away; and this all the more that closely cognate questions are now being, and are likely to be, shortly discussed with some warmth of earnestness by parties holding what appear to those who know the subject to be wholly unpractical opinions. It will serve, therefore, individually some useful purpose, while it will have a direct bearing upon our special subject, if we glance at some of the leading points connected with the subject of small farms, fitted for the yeoman and cottar, or crofter class, who farm to live and live to farm. In taking this glance we shall perhaps be able to arrive at a just estimate of the true elements of the question; and then see upon what the success of small farming as a means of livelihood depends, if carried out on the extensive scale which has of late years been, and is still, advocated, although, as we have seen, in a less pronounced and positive way, by some who claim to be authorities on all matters social and political, and therefore agricultural. Although this latter inference will not be generally admitted as logical by those who really know practically what farming is as a national industry and source of wealth. And another advantage may be obtained from giving the glance we propose. It may, for example, afford the reader something practical in the way of evidence to enable him to decide whether the wide extension of small farming would conduce to the benefit or otherwise of agriculture, and aid or retard the great progress which from one cause or from many causes, art and science — for it is both—have made during the last half-century or more.

The reader will now see the bearing of what we have, in the preceding chapter, and in this, said upon the general question of "small farms," admitting—and it may be readily and willingly enough admitted—that under its most advanced systems such small farming can, and does, yield good results. The question really is, Can those advanced systems be made applicable to the actual conditions under which those are placed in this

country who take to small farming as a means of livelihood? If facts as they exist are to be reckoned with in answering this question, and not merely assumptions or surmises based upon and arising from a desire that things would be as we wish them to be, then we fear this question will have to be answered in the negative. What cannot well be denied must be admitted, and it is admitted that the class who will devote themselves to the cultivation of the small farms, the wide establishment of which we have had so warmly advocated of late years, must be the class of working men. We have said that this cannot be denied, for indeed the very agitation for a large increase in the number of small farms in this country is based upon the desire which those agitating for it have to find employment or a means of livelihood of a fixed character for numbers of those who at present live from hand to mouth, as the phrase goes; if, indeed, this style of living is worthy of the name of living at all in its higher sense. This large increase in the number of small farms thus advocated would of necessity involve the influx to this class of labour of a large number of workmen wholly new to the work of farming. What chances there are that these new-comers to new work would be successful in making that work maintain them comfortably, we leave the reader who has even but a limited knowledge of what farming is to conjecture. No doubt the popular notion of farming is that any one can carry it on, whether he has had experience of its work or not—a notion which has sent many a one to farm with large ideas as to profit, to find out after much painful experience that loss only was to be realised.

That land can be farmed after a fashion—just as we may take up any other business we have not before tried, and carry it on somehow—may be readily enough admitted; but whether the result will be satisfactory, in the only way it can be so, is quite another thing. One would require to be no great prophet to predict that loss only would be the end of a business so carried on. So far from farming, even on the smallest scale, being

so easy that any one can succeed with it by any style of working, the fact is precisely the reverse. It not only requires knowledge and an intelligent capability to apply that to practice, but it demands high and unusual qualities—such as prudence and perseverance—and in the case of small farms the exercise not only of a most rigid economy in all things, but of a self-denial to which comparatively few would care to submit, and which still fewer could truly exercise from day to day in the drudgery of work.

CHAPTER IV.

THE CONTINENTAL SMALL FARM SYSTEM.—LESSONS TO BE LEARNED FROM IT IN CONNECTION WITH SMALL FARMING AS CARRIED ON IN THIS COUNTRY.—THE PLANS MOST LIKELY TO BE SUCCESSFUL IN SMALL FARMING WITH US.

WE are told by the advocates of small farming—we of course allude to that system of small farming which would require for its development the devotion of tracts of land so wide that the vast portion of the land of the country would be taken up with the farms—that there is ample proof of the fact that small farming can be carried on with success; and when asked where that proof exists, we are told that it is to be found on the Continent. We are pointed to France, and especially to Belgium, two provinces of which, East and West Flanders, may be said to be the home or seat *par excellence* of the small farming, or *petite culture*, as it is called. It is an admitted truth, denied by no one, that comparisons are only valuable where the conditions on which the comparative observations are made, and facts collected and considered under proper—that is, true—conditions. For example, any scientific inquiry made to test the comparative values of, say, a given material or of two machines, would only be valuable if the materials or machines were of the same class. To take a case closely connected with our subject. Suppose that it was desired to know which of two soils was the most fertile or valuable for farming purposes, what would be said of the value of an inquiry into two qualities of soil, say of clay, if one investigator took a sample of a clayey and another of a sandy soil? No doubt it would be said that the inquiry would show

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cultural effects which the small farms of the Continent displayed. *This general idea has been floating about* for some generations, and had its origin in the writings of not a few travellers who had, as a rule, merely glanced at the extensive evidences presented by the small farmer on the Continent, and had not deemed it to be their duty—as clearly it had not been their inclination—to examine closely into the details of the system, in order to ascertain the means by which and at what cost the conditions of a fine cultivation, and the high fertility of the lands consequent upon it, had been secured. What, in truth, is known generally or popularly on the subject of the Continental small farm system, is a series of statements by travellers, of a highly-coloured, flattering kind, as to its wonderful results. What is not at all known popularly are the facts which bear upon the system, and the conditions under which that system exists.

And we consider it to be a most unfortunate circumstance that, in the long-continued and warmly—too warmly—carried on discussion or agitation on the subject of small farms, as being essential to the well-being of our people and to the future progress of farming, the popular view above alluded to has been alone presented to the public mind. There are many in this country who know what the accurate view or position is, know well the details of the system—know that it has its weaknesses, its difficulties, and conditions which are not at all applicable in this country. Yet, either through indifference, or fear of opposing a popular belief, or influenced by motives, political chiefly, inducing them to be silent, they have been literally so, and have refrained from giving the public the true facts of the case—showing, what they knew to be the fact, that the Continental system of small farms is not applicable to this country. And, moreover, that it is only in a very limited sense that the Continental system has been a success even there, and that as a rule it has not conduced to the agricultural prosperity of those Continental countries in which it is largely practised. The

result then of this which we do not hesitate to call unfortunate method in which the small farm system has been discussed of late years amongst us, is that most erroneous views have taken possession of the public mind, and for the sweeping away of which some wiser, because truer, influences must come into existence. For the sake of the future of British farming it is to be hoped that if they come they will come speedily. What the ground for this hope is we shall see presently.

CHAPTER V.

THE CHARACTER OF THE LABOUR TO BE DONE, AND THE HABITS OF THE FARMER REQUISITE TO MAKE SMALL FARMING SUCCESSFUL.

THE first of the conditions relative to small farm extension in this country concerns itself with the *personnel* of those to whom the care of small farms, when adopted in the extensive way advocated of late, is proposed to be given. This new system, be it remembered, proposes, if the principle upon which it is based be rigidly and honestly carried out, that the land of this country be henceforth wholly cultivated in small sections, as opposed to the principle of having large and extensive farms cultivated by a comparatively few. And the new system of farming by a series of small sections is advocated for two reasons: not merely upon the ground that it will afford outlets for the labour of a vast number of working men who are at present, through the over-supply of labour in other industrial departments, not fully, or if fully, not profitably, employed; but also because the peculiarities of cultivation on the small scale fall in so completely, so to say, with the necessities of the highest state of cultivation on which the land yields vastly more than when placed under the opposite system of large farming, that it is in the interest of the true welfare of the country that small farms should be the rule and not, as at present, the exception.

This dual condition of the argument in favour of the wide, or rather the universal extension of small farms, necessitates a consideration of two points, in order to enable us to decide whether the argument in favour of the new system be soundly based or not. And this

brings us to the first point—namely, that of the *personnel* of those who will have the conduct of the small farms of the future, if that future ever becomes part of the history of this country. Although the political motives which prompted this agitation for the universal extension of small farms appear to be the true ones for its existence, we, for obvious reasons, do not here enter into their consideration, remarking only that it would be well if, in all cases of new agitations, those taking part in them would fairly look the true motives in the face, and inform the public what those motives really are. This line of conduct would at least prevent the matter being put on false issues, and would go far to obviate those mistakes which have been made more than once in our social and national history.

Assuming for the present the accuracy of the statements of the advocates of the new system of *universal small farming* (we shall see presently whether they be accurate or not) that it alone is the system by which the highest cultivation—that is the greatest fertility or largest products—can be obtained, it is only fair to presume that this will demand at the very least a large amount of personal care. It is but to repeat a truism to say that no work which has any value at all can be done without labour. The more valuable the results of that labour, the higher its quality and the greater need for its careful exercise. We know of no reason why farming should be an exception to this rule. On the contrary, what we do know of it is—or rather, we should say, whoever really knows what farming is knows well—that, so far from being an exception to this rule, it is precisely that calling which demands the exercise of continuous care and constant labour. It is moreover work of that kind, which, if it is to be done well, or rather if it is to be done at all, must be done promptly and at the time. Procrastination is quite incompatible with prosperity in farm work. In almost all other industrial work, what is neglected to-day may be done to-morrow, and a certain amount of time only sacrificed. Opportunities overlooked at one

time may be observed and taken advantage of at another, without more than partial loss being the result of the carelessness or indifference to what is the best method of carrying on a business. But the case is altogether different with the practice of farming. We have in this to deal with and to depend upon times and seasons. Each of these has its own peculiar work, which *must* be done then and there, or not done at all, at least for that year. For the time is not repeated in the same year. The man who neglects the time of sowing may be silly enough to expect the time for reaping to come. It will come, but not with any fruits to him; for those he must wait for another year, in which he may then practise the wisdom his folly had made him overlook or despise.

And it may here be noticed that singleness of seasons or of opportunities of doing work in farming, is one of the reasons, and a very powerful one, why farming has not made such quick progress as other branches of industrial work. Where improvements depend, as all improvements do, upon trials and experiments, time must be devoted to them; and times or opportunities for them are, as a rule, to be had or made at any time with the great majority of industrials. Experiments and trials can be made continuously if desired; the defect noticed to-day can be rectified to-morrow; and this may go on till the new work is perfected and completed. It is not so in the case of farming; indeed very much the opposite. As a rule there is but one period in each season at which a new experiment, or a more extended trial, can be made; and if there be more than one period in either case, or rather both cases, another season must come round; that is a whole year must elapse before the result of the trial or experiment can be made known. If there be any defective point in the principle or the practice of the experiment demanding a new trial, that again will take another season; and patience must be exercised during a whole year before it can be known whether the new modification of the experiment

has been successful or not. While this is true, then, of what are called field experiments connected with crops, their treatment, manurial and otherwise, it is no less true of many other departments of farm-work, of which the following pages will give more than one example.

Some of our readers may now probably, for the first time, be able to perceive how it is that improvement in farming must of necessity, from the very nature of the conditions under which it everywhere exists, be a slow progress. And on looking at the point we have noticed, and taking an accurate view of the circumstances, the marvel is, not that farming progress has been so small, but that it has been so great. And great that progress has been during the last two generations; and to an extent which, we regret to say, has not as yet been popularly comprehended; although those engaged in farming, using the term in its widest possible acceptation, can well offer comparison with those engaged in any other branch of national industry.

One habit, therefore, required of the small farmer, equally with the one who cultivates land on a scale more or less extensive, is that of *promptitude* in the doing of his work. And this, again, demands *system* in its doing; for a man may be very prompt in doing work at the wrong time, which would be better left wholly undone. Promptitude in work must, therefore, go along with an accurate system; the right work done at the right time.

But however promptly and systematically work may be done, unless it be done in *the right way*, the practical point aimed at will be altogether lost. A man may be very prompt, and, for the matter of that, very systematic in the doing of bad work; and in this case good results can scarcely be expected. Now in regard to the work of farming it is unfortunately a very widespread notion amongst the classes who are wholly occupied in other callings, that farming can be taken up, and not only so, but be practised with every success, without any knowledge of what it really is, or indeed without any previous training in the doing of its work. This

is assuredly the popular notion, and finds an expression in the well-known saying, "Any fool can be a farmer." To this it might be only necessary to reply, that any one who would act upon this and attempt farming, would very quickly find that he was a fool for making the attempt on the basis of this too popular and too widely held "foolish whim." But something more than meeting this silly saying in this way is here essential, not merely because it has a very prejudicial influence on the general question now under consideration, but because it has the closest possible bearing on the subject on which we are now writing.

The practical outcome of this popular notion is this conclusion: that, granted that the system of universal extension of small farms is established, all that is necessary to be done is to provide each man who wishes it with a farm, and its proper cultivation will then be insured, and insured in such a way that while he is adding very largely to the general wealth, and ministering to the convenience of the community at large, he is also enabled to make much better provision for himself and family than he could do in one or other of the overcrowded, ill-paid callings with which he had been before connected. The question has never been fairly asked, and can never be fairly answered till the practical points which it involves are fully faced and met: *Could* men of the class above mentioned really carry on farming so that it would be successful in giving them a good living? For if they could not live comfortably themselves by it, it is quite certain that they would not add much to the means of the general community. And if they did not know how to farm, it is, to say the least, somewhat difficult to see how the high degree of cultivation could be secured which the advocates of the wider extension of the system of small farming persist in telling the nation would be one of the inevitable results of that extension. Whether it be believed or not by those who thus advocate the new system of extended or universal small farming, the fact remains that farming, like all other industrial callings,

requires a practical training or education—call it what you will—before one can practise it with that success which alone entitles it to be classed as practical. And this fact, like all other facts, must be dealt with; and it is not possible to have a fact more important than this, for it simply is that on which all the work of successful farming is based, and ignorance or neglect of it has been the cause of immeasurable failures amongst those who have taken to farming as a means of living in defiance of the lessons of warning which it conveys. Our readers may not, in the range of their own experience, know many instances of this, but they abound, and can easily enough be heard of if inquired after. We hear, for example, of the successes of emigrant farmers, and are told again and again that all we have to do is to ship off our unemployed, send them to one or other of our colonies, and make them farmers; all that is required being but a small—a very small—capital to enable them to purchase their "holding" and stock it. But in practice it is found that something more than capital is required. We hear in this country only of the successes of emigrant farmers; failures are seldom and only incidentally referred to. But failures exist, nevertheless, and on a vastly wider scale than is generally supposed. And these failures, in almost every case, are caused by ignorance of what farming is and what are the ways of farming life. From what we saw, and from the much more numerous cases we heard of, while in North America, it was a matter of easy proof that the truly successful emigrant farmer was he who had, if not a good knowledge of the principles of farming, at least a good training in its practical work; and the more completely the knowledge of principles and an acquaintance with the practice of the art were combined, the more successful was the result. We know several, and have heard of many more, who, having taken to farming as a means of livelihood under the popular impression that any one could farm well, found to their bitter regret that, as in every other kind of work, a knowledge of it is required before it can be practised

with success. There are, we know, scores of emigrant farmers who are farmers but in name, who merely contrive to drag out a life, barely providing for the necessities of the day, and yet possessed of land and placed under circumstances so favourable to successful farming, that one having a knowledge of the work would make not only a good and comfortable living, but money. There are scores of men thus dragging out a dreary and hopeless life who would only be too glad, if —with their dear-bought experience—they had the power to leave their ill-requited farming labours with the money, or only part of it, which they invested at the first in this work: work, be it noted, which they were told "any one could do" and do well, but which they have found they at least cannot do successfully.

CHAPTER VI.

SOME CONSIDERATIONS CONNECTED WITH POINTS OTHER THAN THOSE ALREADY NAMED, AS AFFECTING THE WORK OF THE SMALL FARMER AND HIS SUCCESS IN IT.—THE DISPOSAL OR SELLING OF HIS FARM PRODUCE.—MARKETS.

ONE not prejudiced by preconceived notions, or so wedded to a theory that facts must be put aside or got rid of in order to keep that theory intact, would naturally conclude that what we have said as to the fact that to practise farming successfully one must be trained to do its work, is but a common-sense view, after all, of the matter. It does not take much knowledge surely of the every-day working world we live in to see that even the simplest work requires some training, some experience of its peculiarities, before it can be done even moderately well. Digging, for example, is popularly considered to be a work which "any one can do." But there are some who, although they have been digging for years, cannot, and apparently never will be able to, dig well. What appears by mere looking at it, or hearing it talked about, to be a very simple thing to do, when taken in hand is found to be so far from this that by some it cannot be done at all. Take the "milking of a cow," a very essential part of the dairy work of a small farm; this appears to be a simple work enough, yet so difficult is it to do, that it takes some practice before it can be done well; and some have taken years to learn, and after all have been "no great hands at it." And when the reader comes to that department of our work treating upon dairy management, he may be surprised to learn that a very good cow may be spoiled as a "milker" simply by bad and careless milking. Scores of small farmers, emigrant or otherwise, have found this out to their cost.

If a knowledge of, and practical training in, such arts as digging and milking of cows, which are supposed popularly to be so easy that any one can be expert in them, be essential — as assuredly they will in practice be found to be—to the small farmer who aims at being successful in his land, he will find that there are many other things which it is equally necessary that he should know. When we name cropping and manuring the after cultivation of his crops, the feeding of animals and their general management, it may appear that the list of things which the small farmer ought to know is very short, and does not comprise much work. But when he takes up their practice he will find, on the contrary, that each single department is made up of a variety of details, each of which must receive attention, to secure the success of the work as a whole. Now the small farmer on beginning his work, and who is in ignorance of its details, may by experience find out what they are, and may have such an aptitude to learn that he may soon, comparatively, be able to do them. But this at the best is but a slow progress; and while it may be said that knowledge thus gained by experience is best, much, very much, being learned by "failures," still it must not be forgotten, what, however, is too apt to be overlooked, that the small farmer, being, as a rule which has few exceptions, without capital, he may while he is thus learning be in danger of slowly starving. How many even with a good, or fairly good, knowledge of the work of farming, find that at the best their lives on their small farms is but a struggle for existence!

This brings us to the next point in the consideration of the main question. We have seen what are some of the requisites, essential to its practical success, in those proposing to take up small farming as a means of livelihood. These are, a general knowledge of what the points of farming are, at least some fair amount of practical training, and then to these must be added system or order, and promptitude in the actual doing of its work. But these do not exhaust what is necessary

to secure the success of the small farmer who farms in order to live. Taking facts as they exist around us, these tell us that beyond all doubt his life is a very hard one. We have little hesitation in affirming that success can only be secured by continuous, unfailing, unflagging labour; and not only by this, but by an exercise of rigid prudence and economy in living. We have little doubt what the evidence of poor men who live by small farming under the circumstances which exist as a general rule in this country would be; those who were even the most successful would we fear be constrained to confess that "at the best the best was no great shakes;" and not a few would go further, and say that it "was bad at the best." And this, be it noted, where the work was considered in general terms to be a success. One can judge of what a small farmer's life must be where to its inherent difficulties other great difficulties are to be added of an ignorance of what the work of small farming really is, and a want of that practical training by which alone that work can be done.

It will be observed that we have referred to the general circumstances under which the small farmer is placed in this country. We will not consider here the circumstances under which the colonial or emigrant farmer is placed. The discussion of that subject comes under another department, which does not concern us here. In so far as it does, its requirements will be amply met by what we give under the various heads of practical farm work, the details of which will generally be as applicable to the circumstances of the small farmer in the colonies as it is to those in this country. In the colonies the small farmer is placed under very favourable circumstances as compared with those under which his brother works in this country. As a rule, with but few exceptions, he starts by purchasing, or partly purchasing, his land, so that he has not to labour to "pay his rent;" his expenditure in this department thus gradually decreasing in amount as he pays the instalments of his purchase-money. Again, he has in the majority of new localities

that but too frequently in the scantiest of supplies. If they have milk to sell, or—failing to reach this high position in small farming—have only in the way of "stock" produce a few pigs, some chickens, and eggs to dispose of, they but rarely dream of using those farm products as part of their food; whereas the colonial farmer has abundance in this way. With our small farmers the rent ever forms a subject of portentous importance; that must be paid, and if it be low, it is always high to them, although in too many cases the rent-charge is at a higher rate than in the case of large farms. And to meet this rent and the other charges we have alluded to, which are as great troubles to him as the rent itself, is the first thing to be done; then whatever is left, however little it may be, is what the family have to live upon.

We have heard much lately as to the depressed condition of agriculture in this country—a condition which has ruined many farmers, which threatens, if long continued, to ruin many more, and which keeps even the most fortunate of them in that position in which it takes all their skill in farming, all their resources in the way of capital, and all the helps to good farming which that capital secures to them, to enable them even to make a living and pay their way. Even at the best of times farmers who really know what their work is, and how it should be done, and who have, if not large, at least capital enough to enable them to get all the helps to good farming which modern science and resources have placed within their command, do not, even as successful farmers, "score any great success." Comfortable competencies have been made by farming, and where money has not been saved—and where it has not been saved it cannot be truly said to have been made—comfortable, nay, in many respects luxurious livings, have been secured. But at the best "fortunes" are rarely made in life by farming—such fortunes as "successful men" in almost every industrial calling hope to make, and very frequently indeed succeed in making. A cotton manufacturer, or an engineer, or a

merchant who gave the same amount of time, of energy, unflagging care and zeal to his work which a good farmer—and our country abounds in farmers who have the best claims to be considered the best farmers in the world—gives to his business, would grumble very much indeed if his labours resulted in the small returns, and the still smaller amount actually taking the form of profit, with which a farmer is compelled to be content. We say compelled, for it is the statement of but a simple fact to say that land and the work connected with the cultivation of land yields the lowest or poorest return as an investment of all the forms or ways in which labour and capital can be invested. The only point connected with land investment is its certainty of security and the general stability of its returns. This security or certainty, farming or the cultivation of the land largely shared, and it has only become lessened of late years when, to all the evils resulting from a succession of bad seasons, some so bad that they could not be worse, are added the still greater evils of a system which brings about a foreign competition against which farmers have not been able as yet to stand.

The losses from bad seasons are those over which no control can be exercised, and, however large they may be, are such as no one can be taxed with, and are accepted by all as the natural circumstances of the calling or profession. The case is, or at all events it seems to be, different with the evils of that foreign competition of which farmers bitterly and with most abundant reason complain, and which, if it cannot be wholly done away with, can surely in its evil features be somewhat lessened. If it be not a case for commercial legislation, it is difficult to conceive of what practical use legislation is. On all sides the evil done is admitted, and granted that the difficulty of removing or of lessening it be great, surely it cannot be insurmountable. With a high class of mind a difficulty is a thing only to be overcome, and this is generally accomplished where the will to secure it is powerfully present. We have used the words commercial legislation with a purpose, as indicative of the fact

that we do not here refer to what *imperial* legislative enactments alone could do, but rather to that legislation which may be composed partly of the work of legislation properly so called, and partly of that of the farmers as a body, either alone or acting in conjunction with other bodies who are all—some very directly, others indirectly, but all more or less—interested in the true welfare of the agriculture of the country.

But be this as it may, the fact remains that even in its best aspects farming does not yield the high profits which an equal amount of labour and skill in other industrial callings yields. Further, that under the aspects which of late years farming has presented, and which it unfortunately still presents, it is so far from a good paying concern that even with the best of skill, with all the appliances and the aids which modern science gives to its practice, and even with all the help of a fair amount of capital, farmers have a difficulty to make ends meet at the termination of each season. It is not only the opinion of some, not merely the view held by many, but it may be said with all safety that it is the opinion of the vast majority of those whose opinions alone are worth having, that unless the conditions under which farming is carried on be materially changed for the better, the days of good farming are gone—that is, good in the sense of its yielding a moderate return for the labour given to, the skill expended on, and the capital employed in it. We have said that at the best the profits of farming are not so very good, at least can offer no fair ground of comparison with the profits of other callings in which a like amount of labour, skill, and time is expended.

CHAPTER VII.

SOME SPECIAL CIRCUMSTANCES CONNECTED WITH THE ACTUAL WORK OF SMALL FARMS, AND WHAT IT DEMANDS ON THE PART OF THOSE ENGAGED IN MAKING A LIVING BY IT.

If, with all the advantages which farmers who farm on the large scale possess, the above be the position arrived at—and it will be difficult to dispute its accuracy, however easy to some it may be simply to deny its truth—the reader who has followed us thus far may be able to arrive at some notion of what the chances of success are of small farmers occupying holdings running from two up to ten and twenty, and even thirty acres; although holdings of the last-named extent can scarcely be said to come under the category of the small farm truly so called, the wide, if not universal extension of which is so warmly advocated by some. We do not doubt the good intentions of some of those advocates; they may be actuated by the purest and most philanthropic of motives; they may really desire to place working men in positions in which they can make a good living, not only more easily, but with more certainty than they make a bare living as they are now occupied, or try to be occupied, in the overcrowded, worked-out trades of industry. All that we maintain is that before causing men to change their conditions of life, it should be made *quite* clear that that change will be beneficial to them; and that it is the duty of those advocates of the new or proposed system to be as certain as it is given in any case to poor humanity to be, that the conditions of the life of small farming are as they say they are, and not be content with merely supposing that they are highly favourable because they wish them to be. What is then the evidence

of facts as they exist amongst us in favour or otherwise of this idea that the ordinary classes of working men, accustomed to the discipline and to the hours of labour of ordinary work, will be bettered in their circumstances by taking to "small farming"? Let us look briefly at this in view of what has been done legislatively, what appears probable may yet be done in pushing forward the extension of "small farming," or, as it is by some termed, "peasant proprietary." The inquiry is of great national importance. This inquiry, for very obvious reasons, cannot be entered fully upon here. All we can do is to give a few statements merely as to what the actual circumstances of the question are, leaving them to suggest to the reader what ought to be the conclusion arrived at.

We are again and again told by the advocates of a wide if not a universal or general extension of small farming in this country, to go to the Continent, especially to France and Belgium, in order to see what the system is and what it is capable of doing. We are told to do this not merely because it is said that the small farmers there are very numerous, but because the system is universally successful in establishing a style of cultivation which leaves nothing to be desired. We feel assured, from our practical knowledge of the circumstances of the general principles and the actual working details of the system, that the advice thus given is founded upon hearsay, and not upon any real knowledge of what the Continental system of small farming is. If those who had thus advised had this real practical acquaintance with it, we shrewdly suspect that they would not so readily and persistently refer us to the Continent for proofs of the great advantages to be obtained by the wide extension of the system in this country. We do not say that all those who thus advise us have no practical acquaintance with the Continental system, but the great majority have not, and of those who have visited the Continental rural districts comparatively few have examined the system of small farming, while not a tithe have taken the trouble

to give that patient, unprejudiced inquiry into all the details which alone can justify the giving of an opinion as to what the system really is, and what its working out demands from those who live by it.

The writer of this work has had more than mere passing opportunities to see what the system is. He has spent considerable periods amongst the small farms, has devoted much time to seeing the actual work done on them, has had opportunities again and again presented to him of ascertaining how the occupiers live, and has come in contact with, and has had put before him the opinions of men living in those countries who were in every way calculated to be considered authorities. He has lived for a considerable period in the very centre of the districts in which it is admitted on all sides the small farming system is to be seen in its most successful aspects; and has returned after a considerable interval in order again to go through them, and verify or otherwise his first conclusions. To the evidence of others he can therefore add that of his own; but he prefers to give the following as based on the evidence of much safer and higher authorities than he has any claim to be considered, they being Continental authorities, thoroughly conversant with the subject in every detail; contenting himself by merely stating that from his own observation, he can heartily endorse everything which those Continental authorities give.

The first point we concern ourselves with, and to which we specially invite the reader's attention, as bearing in the closest manner upon the probable practical outcome of the establishment of an extended system of small farms in this country, is the classes of men to whom it is proposed that the cultivation of the small farms be entrusted, and for whose social interests, well-being, and comfort the extension of the system is advocated. And here it is necessary that the reader should be reminded that one important advantage claimed by those who advocate the wide extension of small farming is this, that it will remove from the overcrowded cities and towns—and, in like

proportion, release certain trades and industries therein carried on from the pressure of a great number of men who, with their families, will not only be able to make a better, but a much easier living by small farming than they can ever hope to do in their present condition. We have seen, from preceding paragraphs, that before any one can be successful in small farming, he must possess a certain knowledge of its work; not only what it is, but how to do it. Other qualifications, which come more under the class of what are called moral, are no less requisite. Assuming, for the present, that the class of men who under the proposed system take to small farming possess *all* those qualifications, let us see at what cost of personal labour success in it can be secured, and what extent of personal comfort can be obtained by its practice. We are told that one of the great social advantages obtained by a life on a small farm is this, that it would get rid of the necessity of that continuous, never-ending toil by which alone a "living" can be secured in the humble and even in some of the more advanced walks of industrial work, carried on in towns and their suburban districts.

A very marked social characteristic of the past few years has been the diminution or lessening of the hours of labour. Nearly all the trades connected with what are called the constructive arts, such as building, carpentering, machine-making, and the like, give up working at a much earlier period of the day than was the rule not so very many years ago. Factory or mill-hands—such as those of cotton—have a working day much shorter than the wearily long day which was the custom of the trade not long ago. All workers can now get home at a reasonably early hour, and have a long evening before them for the purposes of rest, recreation, or mental improvement; while, in nearly every district, the Saturday half-holiday is almost universal. And if this shortening of the hours of labour be considered a good thing in the towns and cities, on the ground that it ministers alike to the physical and moral well-being of the working people—at least, it is calculated to do so if

the gained leisure time be rightly used—the same benefits should surely flow from a like system in the country districts, where rural or farming labour is the chief and, over a large area, the only work done. But while in towns and suburban districts the shortening the hours of labour has been carried out to a large extent, and is apparently destined to be carried out farther still, the system has not as yet extended to rural districts; so that the labourers engaged in farm or rural work of all kinds keep working on for the same long number of hours which has constituted the working day for generations back. But the working day of the farm labourer is not only long, but it is also uncertain in its length, especially on farms where much live stock is kept. Odd jobs are perpetually coming up, which must be done without any regard to the hour of the day, be it ever so far advanced. And any extra labour thus given by the labourer does not bring with it the solace of "extra pay," which "overtime" generally carries with it to the working man in towns. If, apart from this feature of farm work, the working-man in town—who grumbles grievously at his long hours, and would "strike" if any attempt was made to make them longer, or to cut off his darling Saturday half-holiday—could be made aware of what length of hard-toiling day his fellow-labourer in the country had to go through; if he could read the "time-bill" of some farms, which opens the day of the labourer at half-past four o'clock in the morning and closes it at seven, and then only if the work of bedding-up his horses be finished—some faint, glimmering notion might take possession of his mind that, as compared with his fellow-labourer in the country, he, the working man of the town, had, in place of having much to complain of in his labouring lot, much good reason to congratulate himself on the facts of his daily work, and also good cause to rejoice at rather than complain of it.

So far as present circumstances go—and they do not seem likely to be altered—farm and rural work generally would appear to be of that nature which does not

admit of short days being the rule; and while, in some departments of farm work, the Saturday half-holiday could be given without any great difficulty, in others it could not possibly be given. And even if, in some departments, this weekly half-day could be given, it could be given only occasionally. It never could form a regular feature of farm labour. In the work of towns the materials with which the workmen deal cannot, as a rule, suffer deterioration by the work being stopped from the Saturday at noon. Not so in farming, as, for example, in the case of haymaking, a very serious loss indeed in the quality, and in the quantity also, might, and in many instances would, inevitably be the result of giving up work at noon of any day in the week. The farmer, moreover, has to deal, in his calculations, with a factor which gives no concern to the great majority of other industrial workers—namely, the weather. This, with its proverbial uncertainty, must be taken into account, and all its possible contingencies provided against, as far as a human foresight and human prudence can provide. Hence, while good weather lasts, every possible minute must be taken advantage of; a rule which finds expression in the well-known proverb or saying of "making hay while the sun shines." Again, each class of work in the cropping of a farm has its own season; and while one, to a certain extent, overlaps another, in no case can one be substituted for another: so that, if the season be lost in any one year, there is no help for it; but the farmer must simply content himself by waiting with what patience he may till the following year. And as the extent of each season, or the time during which it lasts, is practically dependent upon the weather, it is obvious that while the weather is good or at all favourable for the work of any special season, every effort must be made to take advantage of every hour of the day, so long as that work lasts. There are some classes of work—as, for example, that of ploughing—which, if done in bad weather, give such bad results that it had better not be done at all; so that when fitting weather is found, there must be none of the time frit-

tered away by indifferent work, which is bad, or wholly lost by neglect, which is worse. Again, in the departments of live stock, occasions frequently arise when certain work must be done, whatever be the hour of night or day, otherwise great loss will follow. From all this the reader not hitherto acquainted with the peculiarities of farm work will see that of necessity it is characterised by uncertain and changeable features which completely preclude any attempt to lessen the hours of labour as a rule, or to do away with the occasion of extra labour or of overtime, or to give a stated or regular half-holiday.

Farm work, then, considered in relation to the labourer who works for wages, can never, unless a very remarkable change comes over its circumstances, present the regular features which alone can give or allow to be given the short hours and the frequent holidays which the working men in towns enjoy. In one sense farm work may be said to be continuous, not allowing of any intervals of rest or cessation from labour; so that, if it were possible for work to be carried on for the four-and-twenty hours, each hour would be found to bring up something to do which could not be so well done at any other time. But if this be the characteristic of the labour of those who work for wages, it is equally, indeed much more strikingly so, of the work of those who cultivate small farms of their own. What a man will grudge to do when tied to do it for wages, he will cheerfully do for himself. This is the law of labouring life, and it is the result of the peculiarities of human nature. And although there are exceptions to the rule, as in the case of men so inherently lazy and so lost to a sense of self-respect that they will condescend to eat the bread of idleness which some one else has to labour for, or prefer to half-starve rather than dig—still it is the rule, that when one has work to do in the results of which he only is interested, he does that work ungrudgingly; at all events does it, whether he grumbles or not, determined as he is to make the best of it. This rule holds true of every class of labour, and that of small farming is no exception.

close of day are well aware of the fact that they have light enough to see what they are doing long after it has got so dark that a new-comer to the spot sees nothing—the eye has gradually got accustomed to the necessary darkness. Many an hour of hard farm work is thus done on the Continent in what literally are the dark hours.

But one does not grudge hard, nay, very hard work, if it pays. If it brings in a good return it is amazing how much a man will do to increase that return. We have said that, in addition to beginning work early and leaving it for rest late, the small farmer on the Continent must, if he wishes to be successful, "eat the bread of carefulness." Literally this is true, for he seldom knows the luxury of butcher's meat. His living generally is of the most penurious character; so much so, indeed, that if he is successful in laying by some money representative of his saving economy and self-denial of nearly all which ministers to what we English call "comfort," that success is gained at a price which not a few amongst us would think a terrible hardship to pay. Those only who have had ample opportunities to observe know the way in which by far the great majority of Continental small farmers live; how they are housed, clothed, and fed; and how few indeed of what are called the comforts and enjoyments of life they enjoy. Theirs is not only a life of incessant and laborious toil, but it is toil which brings to them but few of the rewards which most men like to secure in return for their labour. No doubt the desire to save money, or rather to accumulate what they do save—and those two are quite different things—is very strong indeed amongst the Continental small farmers. It is in truth a passion with them—their life object—to which every day in their daily life is made subservient. And one requires to live amongst them to be able to form a conception as to how they contrive to minister to it, and of the lives they have to lead in order to gratify it. And they can only gratify it by their style of living; for, beyond all question, the margin of

profit left as the proceeds of their farming is so very narrow that, without the greatest carefulness, they could not indulge in a style of living to which, even in but an indirect way, the title of comfortable could be attached. What is good living could not, in the great majority of cases, be attained at all; so that when we know, as we happen to know, how the farming peasantry of the Continent live—and the remark is specially true of those of France—we may have some idea of the sacrifice of personal and household comfort they must make before they can save money.

The closer, then, the system of Continental small farming is investigated, and the more accurately the facts of the lives of the farmers generally are known, the more clear will the conviction be that such pecuniary results as may arise from the labour they give are obtained, first, by a continuous labour—and that, in many instances, of the hardest, but in all the exercise of the greatest patience—and, secondly, by a style of living to which no Englishman would ever think of applying the word "comfortable." The question here arises—and it is one which, however its solution may have been shirked by those amongst us who advocate so strongly the establishment of a system of small farming like that of the Continent, must, or at least ought to be answered, namely: In how far is this system suited to the conditions which we find to be those of this country? We do not here refer to the conditions under which land lies as a commodity to be bought and sold. We are well aware of the extent and nature of the controversies which cluster round this point, and deem it necessary only to say, that there is no difficulty in purchasing land suitable for small farms if small farms, on a more extensive scale than is now the rule be demanded. This is simply the fact, whatever some may say is the contrary. That the purchase and transfer of land might be made easier is admitted, we think, on all sides, and that this reform will be carried out, and that before long, is also admitted and wished for by nearly all.

But the fact then, notwithstanding all this, that small farms are not increasing in number amongst us, or if so, in but a very feeble way, brings us closely up to the question we have already put: Is the small farm system suited to the conditions in which this country is placed? It is not a question of conditions connected with the land; for those who advocate the extension, or the universal adoption, of the small farm system assume that, by some species of legislation, land will be had in abundance, as all the cultivated land will be parcelled out into small lots suitable for the Lilliputian farming which they so desire to see everywhere around us. But the "conditions" we here refer to are those connected with practical points: such as ability to farm well; markets or outlets for the produce of the farms; and last, but not least, the habits, peculiarities, and capabilities of the class of working men who are to be drafted from overstocked trades and labour in towns to the small farms of the rural districts, which being under the proposed system so numerous, will absorb a large number of working men. On some of these points, all of them of vital importance in the true consideration of the small-farm system, we have already offered a few remarks. It is to others of them that we now direct the attention of our readers.

CHAPTER VIII.

THE PROSPECTS OF SMALL FARMING AS A SUCCESSFUL CALLING FOR CERTAIN CLASSES OF WORKERS.—PRACTICAL POINTS CONNECTED WITH THE WORK OF SMALL FARMS.—CHANGES IN FARM WORK DEMANDED BY CHANGE OF FARM CIRCUMSTANCES.

APART altogether from such crucial points as in preceding paragraphs we have alluded to, and which beyond all doubt lie at the base of and are essential to successful, that is, paying small farms, the questions here arise, Are the classes who are looked to as those who are to yield the small farmers of the future system adapted for the life of a small farmer? Are the habits of our working classes such, has the training, physical and moral, been such as to fit them for the exercise of a calling which demands what we have seen it imperatively demands before success can be secured? Are they likely to think that success worth purchasing at the price they will be compelled to pay for it? We leave those who really know what our working men are—not what, for one purpose or another, they are said to be and highly lauded for being—to answer these questions. We are, and ought to be, the last to say aught against rural life and work. Even at the worst, we believe life in the country is better in every way for a man than life, not at its worst, but in some of its low conditions, in crowded towns. But we do unhesitatingly say that in the great majority of instances, if we transported a number of working men from such occupations as they follow now in towns to the work of small farms it would not be long before they would tell us that their condition was altered in every way for the worse. If they grumble now at the long hours of labour they have in the towns, what would they say, or rather

not say, at the very much longer hours in the country? And if they complain—which in pretty strong terms they do—of the hard work they give for little pay, what would their complaints be when they found their labour was longer and harder still in the country, the pay still less in the shape of coin, and a style of living far below that which the work of our artisans, and even the better class of our labourers, can secure?

But it may be said that small farming may be much better in the life it gives and the profits it yields in this country than on the Continent. And as we are so persistently told to go there, in order to see what a fine system it is, and how well adapted it is to give healthy employment and good living, in addition to seeming high cultivation, we are entirely entitled to take the evidence, as it actually exists, which the Continental system of small farming affords. We have distinctly stated the character of that evidence, but we shall accept the position above indicated, and in doing so we have little hesitation in saying that small farming in this country yields little satisfaction to those who carry it on, either in the kind and amount of personal labour it demands and absolutely requires, or in the amount of personal comfort its style of living gives, or that of the profits which flow from it. When we glance at the influence the ordinary—or what we may call popular—small farming has upon the progress of agriculture—*that is, its tendency to improve it in all its* departments, we shall then have incidentally evidence enough to show that the condition of small farms in this country is such as to make it no very desirable occupation to follow by those who, like most of our working men, who desire—and the feeling is quite natural, and pretty generally diffused amongst us all—to give as little labour for as much pay as possible. The reader will therefore not be surprised to learn that an authority who knows the subject well has said that *those are no friends to the working-classes who desire to change their position as labourers in towns for that of small farmers in the country.* And this opinion is en-

dorsed by all who know what small farming is. For beyond all question it can only be followed with such success as can be attained by the exercise of habits of patient industry, prudent, careful, and highly economical living and conduct, and by the giving a great deal of hard and wearying labour. Such habits are by no means so widely spread amongst the classes who are proposed to form the small farmers of the future, according to the system so persistently advocated by some.

We have alluded to that feature of modern farming in this country which is but too sadly and widely known amongst those who practise it, namely, the difficulties which now stand in the way of making it a profitable calling. However numerous and diverse the opinions held on the subject as to the causes of the conditions under which farming has to be now carried on in this country may be, there is but one opinion as to the fact that it is exceedingly difficult to farm with a profit. No doubt the position has in its worst features been greatly aggravated of late years in consequence of unusually bad seasons, which have run over not one or two, but a long series of years. But even with all the advantages good seasons carry with them, the general conditions under which the farmer is now placed makes it a difficult matter for him to secure a balance at all favourable on the right side. So far as corn-growing is concerned, he has to compete with foreign countries which possess advantages that even the most favoured districts of this country do not possess; and corn-growing was at one time and for long the mainstay of the British farmer. And if we turn to the next great resource of farmers, namely, the breeding, rearing, and feeding of live stock for the purposes of the butcher, we find that although it possesses features which will always give the British farmer a commanding position, even here he has to face a competition which, if it be not already very great or successful, has with it such capabilities of extension that it may—not a few entitled to give an opinion maintain that it will—reach a point as serious in its effects upon

our farmers as has been the competition in corn and bread-stuffs, with which they have, to their great loss, had of late years to contend. And if so, "after this —the deluge."

One large source of profit being thus cut off from the farmer, and another already in some degree and to a large extent threatened to be still more lessened, farmers in this country have been, so to say, at their wits' end in what direction to turn and what style of farming to pursue in order to make their lands profitable.

In farming on the old system the products in reality come under three classes only, namely, the growing of corn and of feeding-crops, the keeping of live stock, and the production of milk, butter, and cheese. But now it is admitted on all sides that farming on these, the old lines, is no longer possible, where profit as a source of living is looked to. Hence the necessity of discovering, if that be possible, some modification of the old, or some altogether new system, or some new sources of supply for which there will be a paying demand. Hence also the varying advice given to the farmers by those outside to take up new branches, or to develop old branches in a new way, by which their land could be made profitable. But outsiders are not always the best of advisers, for the simplest of reasons, that they do not know all the circumstances, and are as a rule ignorant of the conditions of and the way in which farm work is done. Hence, the most flattering prospects have been held out to farmers that if they would only concentrate their attention upon certain branches, such as fruit-growing, market-gardening, and the like, they would find such a demand for their new products that a *prosperity as great, if not indeed greater*, than that of the olden times would once more shine on the path of the farmers. But however brilliant the prospects of such changes in styles of farming appear at first sight, especially to those who have no practical knowledge of the conditions under which land lies, and the circumstances under which

farmers have to cultivate it, or make it in some way or another profitable, it is found by those who really know to be by no means the easy thing which so many think it is to make changes in the style of farming.

The changes may be made in some instances easy enough, but it is quite another thing to make them so that they will be profitable. Even in the case of what appears to be a simple change, and which promises, simple though it be, great results, the conditions necessary to secure such success may be practically nearly, in some instances almost wholly, lacking. And it should always be remembered—what is by but too many always forgotten, and by many more still not at all known—that the working factors in farming are very different indeed from those of other industrial callings. In many instances a totally new manufacture of style of goods may be gone into without involving any great loss, or necessitating any complete doing away with old appliances and machinery, and changes can be made, and are made, with comparative rapidity. Not so in farming. The farmer has to deal with the factors of soil, climate, and locality, which vary in various districts, and the peculiarities of each may be such as to render the adaptation of a new system of working, which may be strongly recommended to him, practically impossible. And although all may not be unfavourable, one may be, and it requires all the factors to be present to make the calculation complete. Many, too many, talk and write as if the farmer could do as he liked, when and how he liked with his land; they do not know that the land may be more truly said to do as it likes with the farmer. And what of the locality and its character? these at all events the farmer cannot change or control. Another point is quite ignored by outsiders who are so eager and ready to recommend new systems in farming, and yet it is perhaps one of the most powerful with which the farmer has to deal: in carrying out improved—or new, which are expected to be improved systems—in other callings the necessary changes can be made with comparatively great rapidity. Not so in farming. Changes

demands. And such assumed authorities would be very much surprised to learn that in the opinion of the most advanced authorities, in place of no arable land being required, that if dairying, for example, be brought to a much higher condition of paying efficiency than it now possesses, or has ever in this country possessed, a very much greater breadth of land must be made arable in order to grow the much greater variety and the greater quantity of crops which the good system of dairying will demand. It would be easy for us now to show that if corn-growing is to be practically given over, or at least practised to a much less extent than it is even now, the future success of farming in this country will depend chiefly upon the way in which this greatly extended cropping of arable land is carried out in conjunction with the systems of stock-keeping and dairying so as to efficiently help them.

Leaving for the present further considerations connected with such changes in the style and in the details of farming as the depressed conditions of the calling would seem to demand, we have the fact, acknowledged on all sides, that this depression can scarcely well be worse. A brief digest of each case, showing the struggles which had been made to avoid a pecuniary catastrophe which involved such powerful personal sacrifices, along with a list of those who had been compelled of late years to give up farming as a business from its failing to be profitable, would form a very painful chapter in the social history of this country. Nor would the chapter be the less, but all the more dolorous, if it included also a brief detail of the struggles many are now making to retain that position the loss of which seems every day more and more inevitable.

If, then, such has been the struggling position of farmers to maintain their business—and if such a struggle is still being carried on by many, with whom the issue is very doubtful, the question may well be asked, What chance of success will small farmers have who belong to the class or classes of those to whom small farms on the most extended scale are

proposed to be given? If men possessing a knowledge of practical farming, and knowing the way of making the best of circumstances, have not been able to succeed, what chances are left to those who are quite ignorant of what farming is? And if, with some capital to carry on with and to fall back upon, farmers bred to the business have not succeeded, what hope seems open to those who may reasonably be presumed to have no capital at all?—men who literally live from hand to mouth, and when from sickness or other causes they have to cease working for a time, have simply to suffer from the lack of those necessaries of life which they could obtain only from their work, and have no little stock to fall back upon during "rainy days."

If the difficulties in the way of farmers who know their business well to making it a paying one be so great that even the possession of capital will not enable them to overcome them, and that a complete change in the style of farming be advised, even though there be a doubt in the minds of high practical authorities whether even that change will meet the necessities of the case, it is, we confess, difficult to see what is to be gained by the proposition which we know to be by many so warmly advocated—namely, to enormously multiply the number of farmers. It does seem, to say the least of it, a singularly odd way of getting out of a social difficulty by simply adding to the number of those who have themselves made the difficulty, or, if they have not made it, are assuredly beyond all controversy the victims of it. If farming be a bad business to follow as a means of livelihood; if, to use an ordinary phrase, it is a "losing concern," it seems to be a grotesque proposition to reverse it, and make it a paying business, by increasing the number of those who follow it. This is equivalent to saying, that if you have only a small amount of gain to divide amongst a given number of applicants, you have but to increase the number of those who are to share in it in order to increase, and greatly to increase, the amount of each individual's share. You have twenty shillings to divide equally amongst twenty

people: each gets a shilling in the one case; but to make the amount five shillings, all you have to do is to increase the number sharing five, or six, or even ten-fold. Such reasoning may suffice for some who have a purpose to secure in so reasoning—if the term can, indeed, be applied to a process in which reason has no place at all; but it will not satisfy those who take a common-sense view of the matter. But the points connected with this matter of vital importance to the subject are not yet exhausted; in the next chapter we have to follow them up.

CHAPTER IX.

THE INFLUENCE OF SMALL FARMING ON THE PROGRESSIVE IMPROVEMENT OF AGRICULTURE.—LESSONS TO BE LEARNED FROM THE FINE CULTIVATION OF THE SMALL FARMS OF FLANDERS, IN BELGIUM.—PREPARATION OF THE SOIL.—MANURING.—ROTATION AND CONTINUAL SUCCESSION OF CROPS.—WEEDING AND CLEARING OF THE LAND AND THE CROPS.—THE RAISING OF A NEW VARIETY OF FEEDING CROPS FOR DAIRY COWS.

TAKING the view of the subject named at the end of last chapter, apart altogether from the question as to whether it would be humane to put a great number of those who have at the best to make a struggle for existence in a position where not only this struggle would be greater, but carried on under circumstances and by surroundings which all their previous life and habits would make a pain and trouble to them, it is but fair to inquire whether there be not amongst those who so warmly advocate the general extension of a farming peasantry—or of small farms—some reason held or arguments advanced for their advocacy of this system, other than the absurd and grotesque one we have named at the end of last chapter, and which we have seen to be no reason at all. And this inquiry brings with it several points which have the closest possible bearing upon the subject. And here we are face to face with one of the most singular phases of the discussion which has been of late and is still being carried on so warmly and widely with reference to the extension of the system of small farming in this country. In all the discussions on the subject, through press and platform agencies alike, in the legislature and out of it, while the extension of the system of peasant farming has been warmly advocated—as if this were synonymous with the

extension, or rather the progress, of farming *per se*, that is, as promotive of the improvement of agriculture—the question, so far as we are aware, has never even been hinted at, far less broached: Is this system of peasant husbandry or small farms likely to be for the benefit of agriculture? We have been and are still all assuming that it will be so—in point of fact, the public has held it to be understood as a mere matter of course, that if we increase the number of peasant farmers we in like proportion increase the prosperity of farming as a calling, and promote the progress alike of the science and the art of agriculture. But it has never occurred, apparently, to any one engaged so warmly in the discussion of the question that it would be only right to inquire "if these things are so," if this position be accurate. Again, it seems to have been always assumed that in increasing the number of peasant farmers we were doing that which would best increase their prosperity as individuals, and add greatly to their social comfort and well-being. It may after all be found, if we push our inquiry in that direction also, that we are proposing to do that which, in place of adding to the number of those who were making a fair living by the exercise of only a fair amount of hard work, we should be simply increasing the number of those to whom existence would be "a perpetual struggle." We confess that we have frequently been struck with the fact that this common-sense view of such an important question has never been taken. The matter of surprise is that business men, alike in the legislature and out of it, do not take a purely business view of the whole question. If any had proposed a change in the way of conducting their own business, on the ground that it would give employment to a greater number of people—that in fact, to use the ordinary phrase, the new system would give rise to employment for a "greater number of hands"—would not they as business men have at the very first inquired—nay, have thoroughly investigated—the conditions of this proposed change, to see beyond all doubt whether their business—that is, their profits

or gains—would be increased by the change? If humane men, would they not also have pushed their inquiries further, and have at the least tried to discern whether this increased number of hands would have their position in life bettered by taking up the work necessitated by this proposed change? And if all this inquiry resulted in showing, first, that their business would not be improved by the change, and secondly, that it would not benefit the increased number of hands employed by it, we feel sure that the decision would be in one direction only, namely, to have nothing to do with the proposed change, which had clearly been put before them by people who really did not know what the business was which they offered to improve, as they called it.

Had this common-sense, business-like way of considering the subject been adopted, we should have had fewer absurd statements made in connection with the small farm question than we have had. "Oh, but," say some, "we maintain that the wide extension of peasant or small farming *will* be for the benefit of farming; that the progress of agriculture *will* be enormously promoted by it." This may be maintained, and every one has a right to maintain his views; we have a right to expect, however, that facts be brought forward in support of the view—facts, not assumptions. We have shown certain facts as being inextricably mixed up with, and as bearing upon, of necessity from their condition, the question of small farming. Those facts relate to the *personnel* of the question. Let us see how facts bear on the proposition or opinion of some who hold that, peasant or small farming being extensively adopted, the progress of agriculture itself will be promoted.

In the first instance, let us look at the condition of matters on the Continent; for, as we have seen, it is to the experience of the Continental small farming that we are continually referred, as affording such ample proofs of the beneficial influences which the system all round or in every aspect presents. And in truth

the uncompromising advocates of the small farming or peasant husbandry system had very good reasons in which to go on the Continent for facts in favour of it. Such facts were assuredly found in one or two districts there; it would be a very difficult matter to find many districts in this country in which small farms of the true class could be met with, in which high class or good farming would be met with as well as a comfortable living or competence secured. Good reason there is for the advocates of the system to go on the Continent for favourable examples of the system; they cannot find many here.

And here we would point out a fallacy there is connected with the reference so frequently and so confidently made to the wonderful agricultural results of Continental small farming. We have referred, in a preceding chapter, to a part of Belgium in which there is specially fine and successful farming to be met with; that part is comprised within the two provinces of East and West Flanders. Those provinces were specially the home of the Flemings, of whom every student of history has read so much, and who, in every department of trade, and also in many branches of commerce, were at one time the leaders in Europe. Every young student has read of the famous cities of Bruges, Antwerp, Ghent, &c., and of how their rich citizens engaged in all the trades, and became rich and luxurious through the success with which those were carried on, and the products of which, through their pushing commerce, were known to and valued by the whole of Europe. The "Flemings"—for by this name were known the inhabitants of the two provinces of modern Belgium called East and West Flanders, and in olden times, and for long, "The Low Countries"—were, in truth, the pioneers of nearly all our industrial trades, and were the first who may be said to have become rich and powerful through the success by which they prosecuted them. There is scarcely one of our own industrial trades but what has, in its early stages, been greatly indebted to the experience and, not seldom, to

the personal help of Flemish workmen; and, in some instances, certain branches of industry owe their introduction and establishment amongst us wholly to the Flemish. Nor did this industrial and ever-active people confine their labours to the pursuit and to the improvement of trades and to certain branches of commerce. Agriculture was early taken up by them; and such was the attention they paid to the practical work of farming, that they not only introduced a field practice which rapidly became, and still continues to be, the finest and most productive in the world; they also gave special attention to the introduction of new crops. And it is scarcely an exaggeration to say that to the cultivators of the Low Countries this land of ours owes nearly, if not all, its vegetables and some of those foreign crops which are now the most highly estimated products of English farms for cattle-feeding and for dairy purposes. And it was these cultivators who founded what has for long and is now so well known to all educated agriculturists as "Flemish husbandry." This is not the place to enter into any full or, indeed, even a partial description of the celebrated and highly esteemed system of farming; it will be sufficient for our purposes to give in a sentence or two its leading characteristics, referring the reader interested in its further and fuller study to works specially devoted to the subject—of which, however, there are but very few published in this country—taking the liberty to note our own work, entitled, "Notes of an Agricultural Tour in Belgium, Holland, and on the Rhine," in which there is a full description of Flemish farming in nearly all its departments.

In one sense Flemish husbandry may be defined to be an application of the principles and practice of gardening to the production of the vegetable products which are generally classed as those of the farm. As in gardening, so in Flemish farming, the extent or surface of land devoted to any one particular crop is comparatively small, and in many of the small farms actually small; and, as in gardening, the number of crops

cultivated is considerable. These embrace not merely the crops known as cereal, such as wheat, barley, and oats, which form the staple crops of English farming, but others which are but seldom grown with us, such as rye and buckwheat, which may be said to be practically unknown to our farmers. But it is in the department of green and foreign crops that the peculiarities of the Flemish farming is best seen, and this chiefly in the much wider range of plants which the Flemish farmer has at his command. While we have comparatively few the Flemish farmers have many, some of which, while occupying with them a highly useful place in cattle feeding and in dairying, are almost wholly unknown to our farmers, and indeed are absolutely so to the great majority of them. But numerous as are the crops which the Flemish farmer has at his command, it is one of the features of his practice that he cultivates the great majority of them. He has thus a wide range of food of different qualities, being a practical believer in the benefits of change of food to live stock, though he may not be able, nor indeed is it at all likely to be able, to state the scientific reasons on which this wise practice is based. And as the periods of growth of those varying crops are different, he is able to have at nearly all seasons of the year some crop within his reach. The number of crops which the Flemish farmer is in the regular habit of growing is best shown in the period over which his system of rotation extends. Thus, while in many of our districts, as in those in which heavy soils predominate, our rotations embrace but four crops—that is, forming a "four-course (or year) rotation or system," and in our best and more easily cultivated loamy soils but five or six crops are cultivated—that is, forming a "five or six-course rotation:" in Flanders a rotation takes in many more crops, so many in some instances that it embraces ten, twelve, and even fourteen different crops.

As in gardening, so in Flemish farming in its best forms, the land is never idle; as soon as one crop is taken off, the soil is prepared and another crop is soon down.

And the observant traveller will frequently see one part of a "break" or "strip" of land which has contained a certain crop, being reaped while the part cut is at once being turned over for the seed-bed of a succeeding crop. To such an extent is this rapid filling up of land which has been cleared of a crop carried, that, as in the case of a break of some forage plant which is being cut for the horse-feeding or soiling of stock dairy cows, while the greater part of the break still remains covered with the crop, the part on which the crop has been cut is at once turned over and sown down. And as the cutting goes on from day to day, so also frequently the turning over of the land and its sowing down is effected. The industrious Flemish cultivator does not always wait till the whole extent of the break is reaped or cut before he begins to prepare the soil for a new crop; he follows up the cutting by sowing, so that when the last portion of the old crop is cut, a few yards only remain to be sown down, and thus the whole break is seeded for a new and a succeeding crop.

But it is not only in the way in which he keeps his land under a continual succession of crops that the practice of the true Flemish husbandman is noteworthy. He gives the most anxious care to the stirring and tillage of his soil, so that he secures the deepest possible seed-bed for the resulting plants. And when the plants appear and take possession of the soil, the Flemish farmer, in order to give them all the advantages of that soil, and that its fertilising constituents shall not be taken up by alien plants, wages such a war with the weeds that in the Flemish districts proper it is a difficult matter to find a weed in a field. Certainly some districts might be traversed all over without meeting a field where weeds could be found. Practically it is true that the fields are weedless. We have heard a Flemish farmer say that if he gave a centime for every weed which could be found in one of his fields, he would not have many centimes to give. Nor in the use of a wide range of manurial substances, markedly of town refuse in its richest if

not its most odorous or inviting of forms, nor in their general management before and after application to the land, is the Flemish farmer less marked for his painstaking care. Though in no sense a man of science, he has succeeded in reducing his work in manure to a science, and is infinitely in advance of the practice of his corresponding brethren in this country. And to all this care he adds such a complete system of cattle-feeding in the housing or permanent building principle, that while he gets the highest economy in the consumption of food—none being wasted, as in our almost universally adopted system of open pasturage—he receives in return the largest possible supplies of nutriment for his fields. The Flemish husbandman proper—that is, in the true Flanders districts—works thus in a perpetual circle of operations which ever returns into itself. And it is to be specially noted here that the soil *he* has to deal with nearly all over this district is of the poorest. At one time fields now bearing the richest of crops were but tracts of sterile sand; and what the nature of the process of change is may be seen in some districts in which the work of making fertile fields out of sandy tracts, as, for example, in the dreary desert known as the Campinas.

This giving back to the land what is taken from it is the feature of Flemish farming proper; and it is a duty, so to say, so palpably and forcibly made clear, and the method of restoration so obviously thrust, so to call it, upon one's notice, that there seems but little common-sense is required to urge one to its adoption. Food is produced by the soil; this is consumed and eaten by man and the cattle he keeps; the consumption in time yields substances which, in turn, if restored to the soil, give back to it the elements of fertility of which the food crops deprived it. And if carelessness, indifference, or ignorance prompts the farmer to neglect this restoration, he is sure to suffer loss; and this compensating characteristic of nature in farming is just as clearly displayed in the case of poor soils. The land is, so to say, the most grateful of all recipients: you give

her a little, and she returns much—gives back a hundredfold; and the more deficient it is in those constituents which are necessary to the production of rich crops, the more you give the more you get, and always in a greatly higher proportion than what you bestow. It is literally true that nothing in nature is so grateful as the soil for all you give her of your labour and the result of your intelligent thought. And it is equally true in regard to the plants the soil produces: the more care you bestow upon their culture, the greater the number of helps you give to them in overcoming the difficulties which beset them, the more they increase and flourish; and this in a far higher ratio of productiveness than would seem justified by the care bestowed. Considerations such as these—indeed the very points named—lie at the root of all successful farming. They have not been neglected or overlooked by the Flemish farmer. And in the districts in which he has had to contend with poor soil, in many cases over large districts of the very poorest, it is by careful attention to these points that he has been enabled to change what were at one time but sandy deserts into tracts of highly cultivated country, bearing the richest of crops. The Flemish farmer has made, indeed, his farming the synonym of all that is worthy of imitation in the art.

But the reader must not go away with the notion that the splendid style of farming to be met with in some, constitutes the actual agricultural condition of all, parts of Flanders. We have just had occasion incidentally to note that the style of farming in the Polder districts is poor; in some—it would be more correct to say in many—parts it is of the poorest. The area in which the highest farming is prevalent is comparatively limited; and over a large part of the districts which are generally considered in this country to be the home of the Flemish husbandry, which is so highly and so justly praised, the farming, although good, and infinitely superior to the general farming of Belgium, has still some directions in which improvement is necessary, and which is strongly urged upon the notice of the far-

mer by the leading agricultural societies and advanced farming authorities of this flourishing kingdom.

This rapid survey of the peculiarities of Flemish farming in its best, and what we venture to maintain to be its true aspects, affords, as we have seen, many suggestions of practical value to the reader interested in the progress of English farming. But much as can be gathered from it in favour of the system of small farming, it is altogether an erroneous conclusion to come to, that it is to be taken as an example of the system as carried on throughout the Continent. When our public speakers and writers, who advocate the wide extension of small farming in our own country, refer to the success of the system abroad, and, pointing to the known excellence of the Flemish husbandry—which no one disputes—give it as a specimen of what small farming is throughout the Continent, they make a grave error. We have seen that, even in connection with Flemish farming itself, some have promulgated altogether erroneous statements. They have stated that the Continental small or peasant farming system throughout is characterized by the excellence of the Flemish husbandry. Those who know what Continental farming is, know how very far from the truth this statement is. Peasant husbandry on the Continent is so far from being first-rate in its practice, that, as a rule, it might with safety be said that it is not good, often mediocre, in very many instances exceedingly bad. Let Continental authorities themselves be the judges on this matter. They know better than we who are on this side of the Channel; they live amongst the peasant farmers, and have therefore abundant opportunities to know what their lives and their work are, while we can only guess. We have seen that there are those amongst us who have, for some years back, been persistently praising up the Continental system of peasant farming, as embodying in its practice all that is desirable, and pointing to what it has done as the best evidence attainable of its enormous value to us, if only we introduced it in this country. Those out-and-out advocates of the system would there-

fore have been very much surprised indeed if they had listened to all we have heard, as given by men abroad who know what the Continental system of peasant farming largely is in its daily practice. Still more would they be surprised if they read all that has been written—all the speeches which have been made at Continental agricultural gatherings on the subject. These state, in no uncertain or vague terms, the opinions of men whose position and whose practice give them an authority which can in no wise be gainsaid. Their statements cannot be refuted, for they are founded upon facts. And, beyond all doubt, those facts give such a view of the faults and shortcomings of Continental peasant farmers, *as* farmers, that those who have hitherto been praising up the system as everything to be desired, and as one in every way worthy to be copied by us, must, if open to the stern logic of facts, pause in their warm advocacy of the system, and conclude that they have been basing that advocacy upon surmises—upon statements which, though not made in wilful perversion, are still, we hope, made in absolute ignorance of the facts of the case.

The writer of these lines does not wish to be misunderstood. No one can possess a higher opinion than he possesses of what the system of peasant farming, as practised in *some* districts of the Continent, can do in maintaining and, in some cases, largely increasing the fertility of land under culture, and in making sterile soils fruitful and fertile; and of such districts, of which there are more than one, that part of Belgium in which Flemish farming, in its best or true aspect exists, may be taken as the type. No one can have a more thorough appreciation than he has of the value of the good features of this typical system, nor a more earnest and anxious desire to see those features introduced into this country, under those circumstances in which this introduction could most advantageously be made. In years gone by, through the medium of the agricultural journals, and in more special and permanent channels, he has done his little best to point out what those valuable features of the

highest type of Continental agriculture are, and how they could, with great advantage to English farmers, be introduced into our system. No one can have a higher admiration of the patient spirit with which through life the peasant farmers of the Continent carry out the hard labour of what is practically a perpetual toil; of the sober, prudent, and, in reality, self-denying life they lead. All this, as seen in its natural aspects, has not seldom pleased and delighted him. But although all this be true, and earnestly as he wishes that the same habits of industrious and, in many aspects, blameless lives, could be largely introduced amongst the classes in our own country with whom such habits at present, at least, exist but sparingly, and which certainly do not form a striking feature of their lives; nevertheless, the stern logic of facts, of things as they exist—not as some would wish them to be, and others, in spite of all truth, insist that they are—compels the writer to say that if the advancement of agriculture be the one object, and the easy attainment of a life of social and material comfort be the other end in view of those who so persistently advocate the general introduction of the Continental system of small or peasant farming into this country, then he cannot, with facts as they are before him, see how either the one or the other of these objects, in every way desirable in themselves, can be secured by this introduction.

In concluding this department of our subject, one question arises which bears on a point of vast importance in a social and material consideration of the whole matter, and it is this. Is the wide extension of peasant husbandry—the now fashionable name for small farming when practised as a means of livelihood, not as the hobby of the rich amateur—likely to improve the art and science of agriculture, to increase the fertility of our soils? We have glanced at the causes, many and diverse in character, which have made British farming what it is, at once a science and an art, demanding, because requiring, all the aids which a wide range of other sciences, such as those of chemis-

try, physiology, and mechanics, can give to them; and those in turn demanding from the farmer a high degree of knowledge, skill, energy, business capacity, and, above all, abundance of capital. It is all this which has created new trades of literally gigantic proportions, such as our manufacturers of manures and our makers of agricultural implements and machines.

A very striking commentary upon all this, and the general relation which small farming bears, and which, we venture to say, will continue to bear, upon the progressive improvement of agriculture, was afforded a short time ago. In one of the annual reports presented to the members of the Royal Agricultural Society of England by the Council, a very decided expression of regret had a place. This was to the effect that the small farmers of England have taken little interest in certain movements which the society had inaugurated calculated to promote the welfare and to stimulate the progress of the work of farmers generally—that they had not in any way shown a desire to adopt in their practice on their small holdings an improved system of cultivation, the careful treatment of manures, the wise management of live stock; in short, all those aids to farming success which the practice of advanced farmers and the teachings of men of science had abundantly proved lay open for the acceptance of those engaged in agriculture. In reading this reported "regret" of the Council of the Royal Agricultural Society of England, any one who knows what the circumstances of small farming are will be greatly surprised to learn that the regret was expressed at all. The true matter for surprise would have been, if it could have been stated that the small farmers of England *had* shown even a desire to avail themselves of even one of the improvements of the scientific farming of modern times. Another matter of surprise will be to those who know what small farming is and what small farmers are in this country, how the Council could have forgotten—for they must have known—what these circumstances are; for if they had remembered them, they certainly would never have deemed it necessary to

express their regret that our small farmers were so indifferent to what modern scientific farming offered them. The truth is, as our readers—if they have perused what has gone before this will clearly see—that small farmers acting merely under the exigencies of their farming, which demand the closest attention and the most severe and continuous personal labour, have no time to devote themselves to the study or make themselves acquainted with the facts of what scientific farming can do for them; and knowledge must precede practice. But even if they had the wish they have not the means to avail themselves of all the improvements which science offers them. And if the small farmers of the present—who may be taken as the best representatives of the class, inasmuch as it may be fairly assumed that they have chosen their calling as a means of livelihood—cannot so avail themselves of all the advantages which modern scientific farming offers them, what hope is there that the men who, so to say, would be compelled—certainly to a large extent forced—to the calling, would follow small farming on that system which proposes to make peasant husbandry universal, giving over to their cares, or rather carelessness, the lands which are now in nearly all cases, undeniably in very many, scientifically cultivated, would do better than the small farmers of the present day? If only the facts of daily life and the circumstances by which we are surrounded are taken into account—not surmises, baseless conjectures, nor vague assumptions—we can only see one answer to this pregnant question—pregnant with the gravest of considerations—that answer is entirely in the negative.

CHAPTER X.

SMALL FARMING IN ENGLAND.—ITS GENERAL FEATURES AND THEIR INFLUENCE ON THE PROGRESS OF AGRICULTURE.

We have seen how even the best type of Continental peasant farming can only be successfully carried on by a system of patient toil and by the exercise of habits of prudence and economy, amounting to what, with us, would be deemed painful self-denial. And those who know best those classes of our population from which would of necessity come the peasant farmers in that system which is the dream of the future of some of our politicians, know well enough that it would, even from the most hopeful view of the case, take some generations to educate them into such habits, if many would even care to be educated at all. We have seen, moreover, that the highest results of the best system of Continental peasant farming have been attained by methods of farming many of them unknown to our system—all, therefore, yet to be learned. And those who know how difficult it is to overcome old-established customs, and even to introduce improvements to which no objection can be or is made, may well doubt whether our peasant farmers, on the extended scale dreamt of by some, would be likely to adopt a system so foreign to the circumstances of English farming.

It is unnecessary to enter into any of the details of what really is the position of Continental peasant farming as evidenced by the opinions of authorities which have been made public, and the media we have but just alluded to. We here, of course, refer to the system as it exists generally, not as found in the districts where the best and highest types exist. And it may

surprise some who show themselves such earnest advocates of the Continental system of small farms, to be informed that even those high types of farming practice which as we have seen have features which are well worthy of introduction into our farming system, have faults both of theory and practice which it is in every sense desirable to amend, and which the leading agricultural authorities and societies of the very districts in which the best types exist are doing their utmost to do away with.

But although it is for the system as practised so largely abroad that the advocates of a wider extension of the system of peasant farming in this country contend —how far the arguments in favour of it are based on the actual facts we have seen—it will be necessary for the purpose we have in view to glance at what the practical position of small farmers in this country is, and what the features of the system are in relation to the progress of improvement in agriculture. From the way in which the system has been discussed in certain quarters, it might be supposed, and has, indeed, been by some distinctly affirmed, that small or peasant farming had scarcely a practical existence amongst us. The truth, however, is that small farmers constitute a much more numerous class than is generally supposed, and form, indeed, a really numerous body. We do not care here to inquire whether the term "peasant" farmers should be applied to this class or not. It is enough that the farms they cultivate or hold are small *per se*, and certainly very small in area when compared with the farms of those who make up the distinct, numerous, and powerful body known as English farmers. It has also been stated as the reason why there are so few small farms in this country—which, as we have said above, is a mere assumption which facts will not bear out—that there is almost an insuperable difficulty in getting plots of land so limited in area as to form what would in fact be small farms. On this point we believe we are but echoing the statement of those who are in the best position to give an authoritative opinion on the subject,

that while there are certain difficulties in the way of acquiring small farms, it is comparatively an easy matter to get land suitable for the purpose. Indeed, it is stated—and the statement has never been contradicted—that the supply exceeds the demand. The chief, if not the only, difficulty lies in the direction of the legal expenses connected with the transfer of land from one hand to another. If the purchase of land were as easily and as cheaply effected in this country as it is in other countries (to wit, the United States of America, and Australia) there would then exist no real practical difficulty in getting land suitable for small farms. And we are of those who think that this easy and cheap transferring of land, this capability of purchasing it in a simple ready way, should be secured by legislative means.

If it were so, those who have a right to express an opinion upon the general subject assure us that there would then be no difficulty in at least making the system of small farming much more widely and extensively adopted than it is now.

Whether small farming is a means of securing a comfortable livelihood with a less painful amount of the hard labour from which the advocates of the system are so anxious to secure large bodies of the working classes, is quite another question. So also is it whether the extension of the small farming system amongst us would be likely to promote that progress in agriculture which the advocates of the system assert that it would. It will take up no great amount of space—and to its consideration space could not in the present work be more usefully devoted—to glance at these two aspects of the question. We have seen, what no one who knows the facts of the case will, we think, venture to dispute, that small farming on the Continent demands an amount of constant care, of necessary personal toil, and a prudent, almost—indeed, quite—a self-denying, personal, and household management which we incline to think would be grudged by the majority of our working men, and which, we venture to say, would be looked upon as by

no means the easy, comfortable life which the advocates of small farming say it would give them. We have some practical experience of what is the daily work and life of a small farmer in this country. And that life in its working aspect is not, even at its best, an easy-going life. In truth it is the reverse of this. We do not say that our small farmers give such constant and long-continued labour as we have seen is given by his Continental compeer. If he did, we believe that he would secure a greater pecuniary success than he does. But in order to "make both ends meet" and to secure himself from absolute pecuniary loss which is, after all, only a negative kind of success, labour of an arduous kind is necessary. And it is labour very different in its kind from that which ordinary labourers, and especially handicraftsmen, are required to give. To those each day brings a positive termination to work at which an interval of absolute cessation from it commences, which continues for a good many hours, and the work of the day ends at an early hour and does not begin till a not very early hour on the day succeeding. But those who know what small farming practically is, know well that the condition of its daily work is quite different from this. Its work may be said, in one sense, never to end, for certain work must be done at whatever time the necessity for doing it recurs. The hours of labour, moreover, are so long that any one accustomed to those of the new and almost universally adopted *régime* under which ordinary labourers and handicraftsmen work, who might take to small farming, would, we fear, grumble grievously under the yoke of the long hours of its *régime*. The work, in many of its departments, is, moreover, very severe, as all know who have had it to do—especially in the working of heavy clay lands—and the work has to be done very frequently while exposed to all weathers, whether under the sweltering heat of summer, or the dashing rains and boisterous cold winds of winter.

And if to the physical labour which the requirements of small farming demand be added all the mental

anxiety arising from the possession of but a very limited amount of capital, or, to put it more correctly, of a supply of ready money—infinitely increased when one has none, or has it but seldom, and which is but too frequently the case with the small farmer—his position as a mere worker for a living would not be thought an enviable one by a handicraftsman accustomed to be in the receipt of a fair wage. The latter has, if he be prudent and careful, not only the chance of saving a little money, but is practically free from all those harassing anxieties which the carrying on of all business for one's self brings of necessity with it. That it is "not the work, but the worry" which kills, the small farmer knows but too frequently and but too well.

In cases where the position of his farm is such that he can find a ready sale for the produce he can command, he requires to have no small knowledge of the necessities of the market, and it takes great "nous" or tact on his part to meet them. But even with all the advantages arising from his possessing a good *locale*, his labour is made all the more severe and continuous, and the very extra intelligence in the cropping and management of his little farm gives him cares and anxieties which it is not within the capability of every man to cope with successfully. The case is very different and altogether less satisfactory in relation to its pecuniary success, when the small farmer is located a long or even a comparatively short distance from a good and ready market. The produce which meets with the readiest sale is that suited to the requirements of large towns and populous villages or neighbourhoods. But this produce is precisely of that character which necessitates an immediate sale for it; and this cannot be had if the small farmer has to carry his produce long, or comparatively long, distances before that sale can be effected. And the mere time taken up by the transport of produce to the market, and the return from it, represents a heavy tax upon the money which it yields.

But this by no means exhausts the possible difficulties

against which the small farmer may have to contend. The *locale* of the small farm, for example, may be most favourably situated with reference to the demand for such kinds of produce as small farms conducted wisely yield; but what if the soil of the farm be not fitted for this kind of produce? What if it be of such a quality that no amount of labour given to its cultivation could make it pay by its yielding the produce in demand? For the amount of manual labour which *can* be given to the cultivation is limited, and its limit is soon reached; but if this objection be met, as no doubt it is likely to be met by some of the warm advocates of national peasant farming, with the statement that the manual labour thus incurred may be economically supplemented by machines or implements, our reply is simply this: No; this cannot be. Manual or mere bodily physical labour must always be the only resource of the small or peasant-farmer, for this reason, that there is a natural, or what may be called a mechanical, law which absolutely precludes all chance of employing with success machines or implements in the cultivation of small farms. We shall presently see what this law is; meanwhile we name it as an example of what is sometimes experienced by advocates of a one-sided system when some natural law, with its inexorable demands, makes their theoretical requirements anything but a success. The position above noticed, in which the land of the small farm, however favourably placed as regards demand for farm produce, cannot yet give that produce with paying results, is one not seldom met with. And it involves a point which somehow the uncompromising advocates of an extended system of small farming persistently overlook, namely, the question of the suitability of the soil for the purposes of small farms. Perhaps they overlook it from the fact that they do not even suspect its existence. And yet this very question of quality of soil carries with it issues of the utmost importance in considering the general question of small farms. By some warm advocates of the system it seems to be always assumed that all the small

farms are somehow or other to be provided with soil which, when cultivated, will give the best results with the least labour; in other words, that if soil can only be had, crops will be obtained from it at the least so good as to pay for the labour with a margin of profit over. Such uncompromising advocates of the small farm system forget or are ignorant of the fact that soils, like almost every other substance, vary in quality and value, and that by consequence, while some soils will give good, others better, and some the best results, there are other soils which come under the opposite degrees of comparison, bad, worse, and the worst; and other soils again so utterly bad that by no known method of cultivation can they be made productive.

This, by the way, bears in the closest manner upon that other question of agriculture — namely, the reclamation of waste lands—with which the question of small farms is more or less intimately bound up. On the reclamation of waste lands there has been and still is much loose and useless talk. It would be less loose if some of those who do talk knew at least something, however little it might be, of what they are talking about. It is all very well to give utterance to some commonplace platitude as to the national duty of reclaiming waste lands; but what of the waste lands which cannot be reclaimed? "Let us," said Boswell to the great lexicographer, Samuel Johnson—great also in other noble points of character—"let us play at chuck-farthing." "But," replied Johnson in his sonorous style, "but what, sir, if we have not a farthing to chuck?" The application of this to the point now under discussion is obvious; and it bears upon another question in which small farming is closely concerned. We hear much of what could be done not only to improve the position of the large farmers, but to open up a splendid prospect for the small farmer of the future by turning arable land into grass, not only for the feeding of cattle, but for the wonderfully increased production—so it is said—of milk, butter, and cheese; for every one or all of which it is further said that there

will be a ready market everywhere and an unlimited demand. But here again the farming fact is ignored or wilfully set aside, that there are arable lands which cannot be converted into paying grass lands. And of course a still higher and more advanced farming fact is never thought of, and is never named by those who write and talk about the matter, namely, that there is a method of cropping arable land which will answer in an infinitely more successful way, not only for the fattening of cattle for the supply of butcher's meat, but for dairy produce, than that of feeding off the grass of the poor quality which certain lands can only produce. And the question in an economical sense becomes much more complicated when we take into consideration what constitutes one very important feature in the solution of the problem, namely, the great length of time which it takes to make good grass out of arable lands, during which they yield the minimum of food; in some cases for a time none, to say nothing of the great cost of the conversion; in such cases there is more than ordinary truth in the saying that "Time is money."

One great writer has given utterance to the statement that if you set a man down upon a rock, he will produce from its arid and barren surface crops which will make him a living, the only point essential being that the rock is to be absolutely his own property. No doubt he could cover it with good productive soil, or with materials which in *time* would form a soil; but what if he had not the soil to put upon it? and what is he to live upon while he is engaged in putting it on, or waiting till the materials which are to form the soil get settled down as well? The assumption here is that possession is the only element necessary to secure success in small farming; and it has therefore been dwelt upon and flaunted forth by those who are its uncompromising advocates as if it decided the whole question. But its fallacy is obvious, and it will continue a fallacy so long as poor human nature remains as it is; and, as yet at least, we have heard of no wonderful legislation or political panacea for getting

rid of the weakness and follies of this same human nature. The proofs that the assumption is most fallacious abound so enormously, and possess peculiarities unfortunately so common, that one example is as good as a thousand. The writer of these lines knows of a farmer who in this country "tried his hand," as the phrase is, on more than one farm. In each case the "land was good land;" others had done well upon it, but he, somehow or other, could not do so. The causes were, or rather we should say *the* cause was, obvious to others; but the farmer himself could easily point out other causes which were great grievances to him. These at last so operated upon him that he emigrated to happier lands where they did not exist. He bought land of his own, and so far at least he had gained one thing—the great authority above cited names it as the one thing necessary in success—possession. But somehow success did not come, nor up to now is there prospect of its ever coming to him; the causes which in his opinion operate against this success are as patent as ever any causes here were said to be. Only they go under other names, that is all. It is the same old story over again; it is not what a man *has* to work upon, but *how* he works it, which decides for him the point of success or of failure.

Put some men upon the best land, and under the most favourable circumstances as regards disposing of its produce, and they will so treat it that its results are precisely as if it was the worst land and most unfavourably situated. Place other men under conditions the reverse of the above and they will change barrenness to fertility, will live and live well where the others would have starved, or have dragged out a kind of living death. But how much more easy the task of making land pay to those who do their work well, when their land is not only good but favourably placed in relation to good markets, the reader does not require to be told. And presuming as we do that he has had some fair amount of experience of what manner of men many of those are from whom the great class of our future

small farmers is to be recruited, he will be able to see what elements of new success exist, and these are the more difficult to find when the farming facts we have named are taken into consideration. The truth is that this "great and burning question" of peasant farming, of which we hear so much, is not to be decided by assumption or vague statements, however eloquent the declamations may be in which they are recommended to those who do not think for themselves. Assumptions are easily made, but it is fortunate for the future progress of farming in this country that they are *not* facts. We may say what we like, try to believe and to make others believe that things are what we would wish them to be or say they are, but the facts remain nevertheless; and while we are holding forth as if they had no bearing, they quietly, persistently, and peacefully assert themselves, and we have, whether we will or not, to give way to them and their logic, which admits of no dispute. Facts are—or to give them another name—truth is great, and must and ever does prevail, however much we may assert that truth is a lie, that facts do not exist. And the facts of farming are such that they will assert their power, and influence the question of small farming in a way which some carefully keep out of view in its public discussion, if indeed they know of their existence. And in this last place it seems only a fair thing to expect of them that while professing to expound a subject, they should at least know pretty well something of all its parts.

The best examples of small farms and the most pecuniarily successful are to be met with in England and in Scotland. And this arises not merely from the superior intelligence and the higher class of industrial habits possessed by those devoted to the work, but from the fact that the area of each farm, though compared with ordinary farms is very small indeed, is not minimised to an extent which makes a living even shorn of many of its usual comforts an almost impossible thing. If we wish to know what small farming, carried out on

the scale and in the complete way advocated by some, really is, we have to leave England and Scotland and cross to that in every way "debatable land" of Ireland. A thoroughly full and an honestly carried out investigation of what small farming is there would disclose a condition of circumstances which would give pain to even the most sanguine advocates of an extended or universal system of small farming. We say this advisedly, knowing something of what those circumstances are. We prefer to give evidence other than our own on this head, and the trustworthiness of which will not be disputed. So abundant is the evidence, however, that the difficulty is not to get striking and salient points, but those which will be the most striking in a brief space. What we give will therefore be mere typical and suggestive of what could be given—exhaustive in no sense it is. It will, however, be sufficient for our purposes, and these will perhaps be best met by repeating here what forms a part of the chapter on the subject of small farms in our large work, "The Directory for the Improvement of Landed Property," published by William Paterson, Edinburgh. Two vols. 4to.

In a paper by Professor Baldwin, of the Agricultural School at Glasnevin, Dublin—than whom no one has had better opportunities to know what farming in Ireland is—published in the "Journal of the Royal Agricultural Society of England," are given a series of facts as to the farming of small farmers and their living conditions. "These facts," we remark in the work above referred to, "are very suggestive, and indeed melancholy, as showing the wretchedly low condition of small farms as a whole." Mr. Baldwin, at the very outset of his article, says that the agricultural practices of the small farmers in Ireland are very defective. "In some places," he says, "they are quite primitive. Vast numbers of the occupiers are very poor, while wide areas of land are not yielding a fourth of the produce which could be obtained from them. While many large farmers and graziers partake of the general progress of the kingdom, little or no improvement has been

effected in the condition of vast numbers of the small holdings." He shows, also, that while they have received lately increased prices for their store cattle, and their dairy produce, which have enabled them to pay their way better, their dwellings and social condition have not improved in like proportion. The reader, who may be acquainted with the worst of the bad kinds of cottages and small farm-houses in England and Scotland, will find it difficult, we should say impossible, to find a parallel to the class which Mr. Baldwin says he has seen more than once, where the manure heap was in the middle of the apartment, while very many were found in which the cattle and pigs lived on amicable terms with the families. In every department of farming the defective practices named by Mr. Baldwin are observed. The grass lands are in the very worst possible condition, little or no attention being paid to them. In nearly all but a trifling degree of attention would increase their produce largely. Nor is the condition of the land under arable culture a whit more satisfactory. Good, deep, and early tillage, which alone would increase the produce largely, is almost wholly neglected, and even the inferior work with which the farmer is contented is done in the most slovenly fashion. Weeds grow apace and to such an extent that it is no uncommon thing to see ten tons of weeds in a single acre of potato land. We might run through every department as pictured by Mr. Baldwin, and each and all would show the same pitiable state of matters.

From what we have thus said, we do not wish the reader to infer that the condition of the small farms of England and Scotland is similar; but while here and there in every district examples of moderately well cultivated small holdings are met with, it may be accepted as a fact that the small farms, taken as a whole, are far below what may be called the lowest grade or class of high farming; nor need this be wondered at, when one considers the circumstances we have already named. The truth is, that from simply want of means

the small farmer has no chance of doing justice to his land, however willing he may be to do so. But even willingness would not meet the case, inasmuch as we fear that his antecedents and present condition would not admit of his gaining the knowledge necessary to enable him to carry out the improvements which modern science has indicated. We fear, therefore, that however much it might be, and as some hold is, desirable that small farms should increase over the kingdom, as long as farming goes in the same direction as it is now taking, this increase will not take place; and if it did, unless the circumstances of the small farmers themselves are materially changed, the condition of agriculture throughout the kingdom would not by them be materially improved. That we are not singular in this opinion, which, in truth, is that of most practical men, we may cite here the very decided and indeed remarkable expression used by one not at all likely to take an unfavourable view of the interests of the small holders. This expression is to be found in a paper drawing attention to "the statistics of the question," which, he says, "goes to prove that, if the object be to employ the people in agriculture, and thus produce *dear* food, that object will be accomplished with small holdings with small capitals." And surely that is not the object of those who go in for the wide extension of small or peasant farming.

If the farming of the future is to be successful only by the application of a sound and a high-class knowledge of scientific and natural facts; by the giving of tact, energy, and determination to the actual business of farming; by the employment of all the aids of science and mechanics, and by the possession of sufficient capital; to advise farmers of this class, for example, to use all the mechanical helps now open to the farmer is simply to give them advice which they cannot follow, or which, if they do follow, will land them in loss and difficulty.

There are some who advocate the general establishment of small farms as a national duty in national

interests, who seem to assume as a matter of course that those interests would be promoted by a greater extension of cultivation than they assume exists at present, and this in consequence, as they assert, of the wide area of land which would be reclaimed by the new army of industrious, plodding, and prudent workers, and which would be made to yield produce where it now, under the present system which they so denounce, yields none. We have seen what are the natural and practical difficulties in the way of making this so much talked of "reclamation of waste lands" a realised fact —difficulties which with the resources, or rather the lack of them, in the case of small farmers, we do not hesitate to say would in the great majority of cases be insuperable; and those resources involve, be it noted, not only the possession of capital, but of a wide range of knowledge, skill, business habits, and personal qualities, which he would be a very bold man indeed who would say are now possessed, or likely to be possessed for some generations, by the classes who are, we presume, to be taken in thousands from town employments and relegated to the work of rural districts and a style of living with which not one out of ten have even in the slightest degree been acquainted, and for which, as a rule, the great majority by their training and acquired habits are utterly unfitted. But the uncompromising advocates of the "National Small Farm System" assume, or appear to assume, and quite as a matter of course also, that the numerous class who would work under it would, as an apparent necessity of their position, avail themselves of all the helps which our agricultural implement makers have of late years placed at the command of our farmers. These have freely and largely availed themselves of all the aids to economical and efficient working of soils and harvesting, &c., of crops which such mechanical contrivances are so well calculated to give. But these out-and-out advocates of the new small farm system forget, or do not choose to remember, that the circumstances of the small farmers are not merely widely, but altogether different from those farmers above alluded to,

who constitute the class, as a rule, of large and efficient cultivators of the soil and breeders and feeders of cattle.

Blameworthy as the advocates of the new system are in thus wilfully or carelessly neglecting to take this important factor in the calculation into account, they are still more so when they assume that the small farming of the proposed future is to be helped forward by the powerful aids which farm mechanism and implements are so well calculated to give; blameworthy, we venture to say, in no small degree, inasmuch as it seems to us to be but a reasonable thing to demand from those who advocate a new departure, and more especially when that is so revolutionary in the general acceptation of the term as that of the national small farming or peasant husbandry system is, that they shall at the very least have some fair degree of accurate knowledge of all the factors which are essential to the successful solution of the problem. Now if they had cared to inquire, the advocates of the new system might have been made aware that there is an economical or technical law which so operates that agricultural mechanism can only pay for its employment when farms go above a certain acreage, and which will not and cannot possibly do so when the acreage falls below that point; and it is scarcely necessary to say that the great majority of the proposed small farms of the future are far below the paying point at which agricultural mechanics can be employed. Certain it is that if this be the condition of the farming of the future, the home trade of agricultural implement making will cease to exist, and our agricultural engineers may indeed even be compelled to close or greatly limit the output of work done in those large establishments which have for so many years found ready employment for thousands, which will then be wholly for foreign and colonial customers. So will all the other departments of practice.

Small farmers may be advised to avail themselves in their practice of all the aids which science offers in the way of improved methods of treating soils, of manuring them, of breeding and of feeding stock, &c., &c. But

all this requires money, and money is what not many, if indeed any, of the class possess, and even if they had, it is so very doubtful that one may decide that it is almost certain that they would not spend it in those directions of advanced farming. For it must be remembered what, indeed, is but too frequently forgotten, that the very first step to be taken in the adaptation of requirements in the conduct of a business, is to be convinced that such requirements are worth the cost which they incur. This conviction of the pecuniary value of improvements in work, which must precede their practical adoption, is precisely the conviction which small farmers lack. And its possession presupposes a previous education which they have not had, and so far as present circumstances indicate are not likely, as a body, to have. We find a parallel case in the general run of industrial work. Years and years have been devoted to discussion on the pre-eminent value of technical knowledge as the thing wanted to improve practical work, and to enable the workmen to meet successfully the competition with which they are on all sides surrounded and which is carried on so vigorously by other countries. Schools, colleges, and classes for the imparting of this technical knowledge or science have been established, but numerous as they, in the aggregate, are, the teaching power which they supply is far below what the demand would or should be. But this demand does not exist—and lauded as all the means of imparting technical science are, they are not even fully availed of by the very class for whom they have been instituted. And this for the most easily understood of all reasons. Our industrial workers, as a body, are not yet convinced of the truth that technical knowledge is of a real, direct pecuniary advantage to them. Convince them generally of this, and the dozens of technical classes now existing would have to be supplemented till they became hundreds. In spite of all that has been done in behalf of technical education, we are apparently far from the period when our workmen will, as a body—not here and there as now—see that they must have it.

Those only who have a practical every-day knowledge of working men as they are, know how difficult it is to persuade them that their pecuniary interests would be promoted by knowing and doing something which is apparently extraneous to their daily work, something extra or which has to be added. We say, apparently, but the truth is that they persist in seeing that it is actually extraneous or added, not inherently connected with or forming a part of their work as it is. So completely are their minds dominated by the concrete, the actual form, shape, and modes of manipulating the materials used in the objects they make, that not a tithe of them ever think that there is absolutely a certain principle or principles underlying that work and giving a material help to it, some knowledge of which would enable them to do that work better. It is quite in vain to tell the great majority of them that the lessened demand for their labour, or the lessened wages which it brings, or the competition of foreign nations, would be prevented by a better capability of doing higher class work through a knowledge of the principles upon which that work is based. It is enough for them to decide, and with their decision they are quite content, that some other cause is that which brings lower wages and lessened demand for their labour. And those who know what the working men are know well enough how ready they are to attribute to others the causes of bad trade or low wages, and how seldom they think, almost never admit, that these causes have anything to do with their own conduct in the matter.

All this is, perhaps, more especially true of those engaged in rural work than of any other class, and it would not be the less true if the class of small farmers was increased as greatly in numbers as some wish to see it increased. Those who are now engaged in the calling of small farming are precisely those who will not avail themselves of all the advantages which modern scientific agriculture offers. Very recently, in one of the annual reports of a leading agricultural society, expression was given to the surprise of the Council that the

body of small farmers throughout the country had shown no disposition to avail themselves of all the aids which the Society—all its work being based on scientific principles—offered them. Had the Council thoroughly known the class of men who are small farmers, and the circumstances under which they are placed, their true matter for surprise would have been if they, the small farmers, had shown even a disposition to avail themselves of all the influential help which the Society offered. Still greater the surprise would have been had even but a few of them actually gone the length of accepting it. It is, in fact, in vain to hope that farming on the small scale will be benefited in anything like the proportion in which farming on the large scale is benefited by the adoption of scientific principles and aids to its practice. From the very fact that *it is* farming on the small scale, we have seen that it is at once shut out hopelessly from any participation of the current advantages which have been bestowed upon farming on the large scale by mechanical aids or helps; and it is, to say the least, very doubtful whether all the improvements in other departments can be availed of in its practice.

The real strength of our technical workers in other branches of industrial art lies in the precision and accuracy with which their work is done, and in the higher class of the workman himself. It is this thoroughly practical character in the *doing* of the work which has given us the pre-eminence as workers, while we enjoy more largely the monopoly of every branch of trade. So it is with the small farmer—his chances of success depend almost wholly on the completeness with which his work is done. And of what the nature and character of his work is, the Flemish farmer gives him the highest of examples. The Flemish farmer makes no pretension to be a scientific agriculturist—the very phrase is to the great majority unknown; and if they know what it means it is a sealed book to them. But their practice is scientific in many of its aspects nevertheless, and it has interpreted and illustrated

many of the principles which science has propounded. If our small farmers would imitate carefully the practice in every direction of the Flemish farmer—we have briefly described what the practice is—they would have the best chance of becoming successful. They would at least make the very most out of their land, but whether that would meet the somewhat exaggerated expectations of the new school of political economists is quite another thing.

The reader will now be able to decide whether the "extraordinary" extension — the term under our national circumstances is certainly allowable—of small or peasant farming, so earnestly advocated by some as the "panacea" for all the social evils our present system is said by them to be the cause of, is likely or otherwise to do either one or other of two things, or both, which the advocates of the new system assert most strenuously that it will. Those two things are, first, ministering to the well-being of working men, by giving them a means of securing not only a comfortable living, but one easily carried out—more easily, indeed, than other branches of work—that, in fact, small farming is an easy way of making a good living. The second is, that it will be for the benefit of the nation if small farming were the rule, the land being then so much better cultivated, farming would be more satisfactorily conducted than it is now, or ever can be by our present system; and, being better cultivated, the nation will be all the richer through the increased amount of food products. It may be that both of these exceedingly desirable objects will be secured by the new system; we confess to seeing nothing in the present conditions with which we are surrounded to justify this belief; and there is little hope that those conditions will ever be obtained, and that simply because they are natural, not artificial or of man's making.

One thing is very certain, and it has been commonly overlooked in the discussion of the whole question, and it is this—that under what is proposed to be the new *régime,* all the successful improvements connected with

the soil and its farming, which we have witnessed, could not have been made as they have been. We hear often the saying quoted, that "he who makes two blades of grass grow where but one grew before," is the greatest of benefactors of his kind. What then shall be said of him who has made hundreds of acres of land capable of growing crops out of places where no growing soil previously existed? Broad tracts of land, now of the highest fertility, are being rapidly brought into that condition which a few years ago were simply wide, dreary-looking sea margins, over which the tide at times partially, at other periods wholly, flowed. Hundreds of acres along the banks of tidal rivers which practically served no useful purpose, have been taken in, and now prove some of the richest lands in the kingdom. While this work of reclaiming land from sea and river margin has been going on steadily during a long course of years, in inland districts, vast tracts of moorland, marshes, bogs, and sandy heaths have been reclaimed, and are now bearing crops yearly increasing in value. All this has been done in individual cases at great expense, and in the aggregate involving an expenditure which can only be designated enormous. One ducal house has spent over a number of years no less a sum than two millions, and it is spending still; and an outlay of tens of thousands in other cases has been by no means a rare thing in the history of land reclamation. All that has been done has been done by private enterprise, and has been done, moreover, under circumstances by no means encouraging. For it must be remembered that the money invested in such improvements in landed property is an investment which yields a return slowly; and even at the best, and when the finest results are obtained, the return for capital invested is but poor; so poor indeed, that no manufacturer or tradesman would think it worth his while to lay out capital and give his time, knowledge, and skill in work which yielded profits so small. Like the planting of trees on an estate, the reclamation of land can in no sense be said to be a

work which will immediately selfishly benefit him who now carries it out. It comes more under the category of work done the full benefit of which will be received by the generation which succeeds rather than that in which the work was done. It takes a higher class of far-seeing business prudence to enable a man to undertake all the work and the worry—and there is plenty of both in connection with it—involved in land reclamation.

All this is known but to a very few, and nothing, probably, would surprise the general public more than to have all the facts connected with this truly national subject made fully and clearly known. The public would then have some notion of the wealth which has been, so to say, given to the nation by numerous individuals, for every addition to the means of raising food for our teeming population is literally so much added to the wealth of the nation. Work of this kind, the national value of which no sane man would dispute, can obviously be done, and only be done, by those who possess capital, and so much of it that they can wait for years till returns are yielded for the money laid out. And although it be quite true that the small holder can, by patient and long-continued industry, reclaim land and make poor land fruitful, still there are many cases where the highest engineering skill is necessary in order to make the work of reclamation of land possible. And in cases of this kind the small holder is powerless to effect any good. This may, indeed, be said to be his position invariably in relation to the reclamation of land, for he has of necessity to live. And if to make a fair living out of soil of ordinary or average quality, he has to work very hard indeed, he cannot be expected to do much in the way of reclaiming land, should he have land requiring to be reclaimed lying near or forming part of his holding. And it should be remembered that the land which has been so largely reclaimed has been so locally situated that farmers wishing for small holdings would never have gone near them.

And when we turn from the consideration of this

source of increased national wealth gained by what has been done in the reclaiming of land by experience and skill, and that of the highly improved style of cultivation introduced by modern farmers, we find that all the improvements in farming have been effected by men possessed not only of capital, but of the far-seeing business prudence and skill which promote the spirited laying out of capital in the application of new methods and of new appliances, which alone can give the highest results. Apart from the possession of capital, what is demanded from the farmer is an educated and trained intelligence, without which capital would only be uselessly expended, if expended at all. We have seen how small the chances are that the class to whom we are told to look for our farmers of the future are likely to possess either the capital or the educated intelligence which all authorities combine, without a single exception of which we know, in telling us must be possessed by those who hereafter devote themselves to farming as a means of living. And such authorities alone have a real right to give an opinion upon the general subject, for they know all about it; and they do not hesitate to express that conviction which is based upon facts, that with the proposed wide or national establishment of peasant or small farming the progress in agriculture is, if not doomed, certain to be so greatly retarded as to amount to a national calamity.

In concluding our remarks on this subject of vital importance to the best interests of our people, and in so decidedly giving expression to an opinion so hostile to the universal, at least, extensively wide, adoption of small farming or peasant husbandry so warmly advocated by some, let us not be misunderstood. To the further and wider extension of small farms than at present, if they are occupied and cultivated by agricultural labourers, there can be no objection; so far from this, we go with those who believe that for some wise and sound social reasons, it would be well if this kind of extension was realised to a considerable extent. That, however, we venture to say, would not

be quite so wide as some may, under the influence of the wave of somewhat wild talk about peasant husbandry which has passed, or, rather, we should say, is as we write, passing over the country. For those who are truly peasants—otherwise, as they are called, agricultural labourers—know well enough that a small farm is not the paradise which they are told by some that it is. There are not a few peasant or small farmers, and those, moreover, in the districts best calculated to give small farming the best chances of success, whose social condition, so far as regards mere living, is little better—in many cases it is not so good—as that of agricultural labourers. While, in addition, they have all the carking cares of a business the whole expenses of which they must meet, and not a few have the further cares attendant upon the having to find the money to pay interest on borrowed capital. It is a simple truth that many small farmers can, with all their toil and privations, but pay their interest and do no more.

Still, notwithstanding all this, with the advent of better times, possibly with only a comparatively small improvement in those which have for some years ruled—there are many agricultural labourers--the true peasants—who would gladly take small farms if greater facilities were thrown in their way to get them. Facilities such as the cheaper transfer of land and others of a kind which will suggest themselves on consideration, and chiefly of a social character, it would be wise to give. And although we still maintain that even with this class of agricultural labourer, acting as small farmers, the progress of sound scientific and therefore the highest and most economical agriculture, would—and from the very nature of the circumstances in which the peasants would be placed—could not be advanced; still we admit that the class, the agricultural labourers, would have the best chance of succeeding as small farmers so far as making a mere living for themselves was concerned. They, at least, know what the kind of work is which has to be done on small farms, and for the most part—not, however, always or of necessity—how to do it.

While, therefore, we should be glad to see a limited extension—and which we believe would for natural reasons, after all, be indeed but limited—of small farming, with true peasants or agricultural labourers as the farmers, we must unhesitatingly deprecate any extension based upon the system we have heard so persistently propounded by certain politicians through the medium of platform or press, and this we do, if for no other reason than in the true interests of the nation.

For we have brought facts in abundance, and if space permitted we could add largely to their number, which prove, we think beyond dispute, that a general or widespread extension of small farming, replacing the present system, would be to the great detriment of agriculture, and would certainly for long put a stop to all true farming progress. Those systems so ardently advocated by some have as one of their main objects, if, *indeed, it be not their only purpose, the putting of* handicraftsmen chiefly accustomed to town work into the small farms created, as well as the agricultural labourers who are better entitled to the name of rural workers than any class of townsmen can be. What are the chances of this class of handicraftsmen or small tradesmen becoming prosperous farmers, not only in securing a good living but in aiding the progress of sound and economical farming, we have in preceding pages endeavoured to show.

Up to the present we have made no allusion to the way in which the land is to be obtained for the vast number of men who under those new systems would be transformed into what are called peasant husbandmen. In truth, the methods gravely proposed are so wild and altogether so subversive not only of what is just, but what is common-sense and fair play, that a mere passing allusion to them is all the notice they deserve here. We leave it to other pens than ours to expose the utter absurdity of the proposals made, to say nothing of the way in which they set aside all those laws which form the very bonds which bind society together in the tie of a common interest. Take

the least wild of the plans proposed by which land is to be obtained for the extension of small farming, workpeople to be the small farmers. By this scheme it is proposed that corporate—that is town or borough—bodies shall have the power to buy up lands in their neighbourhood, which are, under the most favourable circumstances, to be parcelled out amongst the workpeople. Of this we have only to remark that the very nature of the scheme indicates on the part of those who have proposed it a strange lack not only of human nature, but a still stronger lack, if that be possible, of knowledge of what the classes are with whom the scheme proposes to deal. It takes but a very small modicum of acquaintance with the class of men who compose corporations to know beyond all doubt that if it were the object of the scheme or system to get a class of men the least fitted for carrying out any plan connected with agriculture, the object could not be better attained. Such men would ruin even the most feasible scheme; what could be the result when even the system committed to their care is, as proposed, one wholly unworkable, at least in an agricultural sense? As to what is to be expected of the other class with which the scheme proposes to work, namely, the workpeople, we need say nothing here.

We have endeavoured in preceding pages to show how ill fitted they are to gain a good or an easy living out of farms, how little they could help in the progress of sound farming. As to the other scheme proposed, by which land is to be obtained for the general adoption of small farming or peasant husbandry, and to which the fine phrase denationalisation of land is given, what can, what need here be said? Putting altogether out of sight or consideration all the points we have tried to make clear which bear upon the question as to how far and in what way small farming is to influence the future production of food for our population, points which prove we think very clearly that it would be strongly against all improvement—have, we may ask, the proposers of this utterly wild and revolu-

tionary scheme thought of two difficulties with which they would have to deal? What of the allotment of the lands taken from the landlords? Who is to allot them? We presume the task would be given to commissioners, so-called. Unhappy men! However would they stand against the storm with which they would be inevitably assailed? In unison with the very principle upon which they had taken the lands, all participating in the spoil would of necessity have an equal right to the land—it belonged to the nation, and they belonged to it, or rather made it. Each would thus have a right to the best land, and the best land each would naturally demand. But nature would be stronger than even the people's commissioners, and what would they do in cases where nature not only refused to give much good land, but positively refused to give good land at all? What of the barren, what of the inaccessible spots? Tom Jones would scarcely be expected to be pleased with the commissioners if they gave him an allotment of bog or marsh or utterly barren land, or a plot on the top of a hill almost or perhaps quite inaccessible in itself, and certainly far from market. Tom would, we fear, be somewhat strong in his language to the commissioners and if he were strong enough would be very apt to dispossess his former crony, Bill Sykes, who happened to have for his allotment from the commissioners one altogether good and fertile, and in a very favourably located district.

But the propounders of this scheme have another difficulty to meet, and as it concerns some of them personally it is possible they may give a little heed to the warnings which it gives before they proceed much farther in the direction they have taken at present. It appears it is proposed that only the landlords' lands shall be taken by the nation so called—the landlords, it is presumed, having no right to consider themselves as part of it. But do those of the new school who propose this method of dealing with the property of a disliked class, and who happen to have lands of their own, conclude for a moment that those who had shared in the

spoils of the landlords would stop there? Those who think they would little know them. If the working classes hate, as is said—though we do not believe it, the landlords, *i.e.* the aristocracy, much, they hate and detest the capitalists more. They will make no fine-drawn distinction between the land belonging to a lord or a squire which has been laid out into large farms, and the lands which belong to rich manufacturers or tradesmen, and which are laid out in extensive pleasure grounds and costly gardens, carrying all the costly structures which a lavish expenditure of wealth can secure. These are no less land than the other, and if Dick, Tom, and Harry once taste the delights of the plunder of landlords, they will not long hesitate to share in those which come from the plunder of their more immediate masters. This scheme of land denationalisation is, indeed, scarcely worthy of being noticed here at all, so wild and visionary is it, nor would we have even alluded to it had not some reference to it been necessary in order to complete our subject.

In conclusion, if the wide extension of small farming or peasant husbandry—to quote the favourite phrase—is to depend upon the realisation of either one or other of the land schemes proposed by those who are called "men of advanced opinions," we fear the extension will be postponed for many a day. Nor, if what we have advanced in preceding pages be sound in the main—and it is based upon facts as they are, and not upon what some would like them to be—the nation will have little room to regret that this is likely to be so.

CHAPTER XI.

THE TAKING OF THE AMATEUR SMALL FARM.—AGREEMENT.—RIGHT OR LIBERTY TO CROP.—DIVERSITY IN THE STYLE OF CROPPING, ETC., A FEATURE OF THE AMATEUR FARM.—EXPERIMENTAL FARMING.—IMPROVEMENT OF THE AMATEUR FARM WHICH HAS BEEN NEGLECTED.—FENCES.—GATES.—ROADS.—FOOTPATHS.—CLEARING LAND FROM WEEDS.—IMPLEMENTS.—BUILDINGS.

THE existing small farms—that is, those which are already laid out—which offer themselves to the notice of the amateur farmer, or of him who desires to become one, are divisible into two classes: first, those which are in good condition; and secondly, those which have been allowed to "run down," as the phrase is—that is, which have been neglected or farmed very badly. The good condition here named refers to the land, but it does not follow that in other respects the farm will therefore possess all the features which characterize what is called a well laid-out farm. The fields may be awkward in shape or outline, which for certain work may be bad enough. But they may also, as regards extent or size, and in direct relation to each other, be such that the different purposes of the small farming operations may not be easily carried out. The relation also of the buildings, such as they are, may also be bad; while the nature and extent of the accommodation afforded by these may be anything but conducive to economical working. A desirable farm, then, involves two things: first, the land in good condition, or "heart," as the phrase goes; secondly, that the whole be well laid out; this last involving again the secondary points named above, such as convenient division of the fields, and convenient position of and appropriate accommodation in the buildings.

So many of the small farms open to amateur farmers have, as it were, been formed by chance, that it is not many in which the happy combination of features just named is displayed. Sometimes they are formed by cutting off a corner, part of a larger extent of land. More frequently they consist of small, or comparatively small, patches or plots of land which lies between and is surrounded by large, or larger, properties or estates. Those patches have been held by generation after generation of proprietors, who have pertinaciously kept to their land, resisting all offers of purchase made by their wealthier neighbours whose property surrounds theirs, and who have also for generations coveted to have the small patches in their possession, in order to "round off" their bigger properties. But however formed, the "chance" element has been so predominant, as a rule, that small farms suitable for amateur farmers, so far as extent or acreage goes, are not always suitable in other respects. There are very few amateur farms which have been laid out purposely for this class of work. At the same time many of those which have existed for generations in their present form are so held by their proprietors that arrangements can frequently be made with them by which the tenants can greatly modify the form of the farm, its fields, and its buildings, so as to bring them more in unison with a good system of working. In such cases, where the tenant may have the right given to him to make alterations in the mode of setting out the fields, he should be very careful to see that in his written agreement this point is specially stated. The landlord may give the tenant very wide range of liberty in this respect, leaving him, to use the popular phrase, to "do as he likes;" or, on the other hand, the landlord may allow the tenant to do only certain things. But in all cases it will be only prudence—whatever be the extent of the liberty the tenant has in the way of making alterations, or as he will esteem them, improvements—on his part, to have all the points clearly expressed in the agreement.

At the first blush of an arrangement between land-

lord and tenant, both are somewhat apt to take a rose-coloured view of the relation of each to the other, and statements may be made as to what the tenant may be permitted to do and what the landlord is willing should be done, which may afterwards be disputed. In all honesty and integrity they may state that certain agreements were positively made at the time, and yet those statements may be anything but correct. Both have trusted only to memory, but memory is too well known to be treacherous; so that what one believes in all good faith to be true is not so. But if memory be not absolutely treacherous, and statements be remembered, these statements may be misunderstood—one may take his neighbour to mean what he had by no means intended to convey. All such circumstances often give rise to disputes, which may easily be avoided if agreements personally made at the time of negotiation be immediately committed to writing. If oral statements be misunderstood or misapprehended, they will be sure to be corrected when the draft of agreement is read in which they find a place. It is nothing derogatory, as some seem to think it is, to either party to a negotiation that one should ask that its terms be committed to writing. It does not follow that one who asks this has any doubt of the integrity of the other; it is simply a common-sense precaution taken to prevent contingencies which may be disagreeable arising through lack of memory or a failure to understand what has been said. A large number of disagreeable disputes would have been avoided in business transactions had the simple precaution here strongly recommended been adopted. It is not necessary in all cases that the written agreement should take the form of a legal document, with its possible loopholes and its inevitable cost. It may take the form of a letter written by one party and acknowledged by the other "as in conformity;" all that is required being to record what really was agreed upon, and thus prevent what might otherwise have given rise to a dispute, had memory—or, "I understood you to say"—alone been trusted to.

As a rule, amateur farmers are not burdened by restrictions as to cropping. Almost the only point reserved, and this only in exceptional cases, is where certain fields are laid down to permanent pasture or for meadow land. In some districts, especially in those in which pasturing or grazing is carried on largely, some proprietors have such a love for the "green fields," or such an exaggerated notion of their value, that they will on no account allow them to be turned over and put under arable culture. In such cases the value of an agreement will be well understood, for we have known the tenant of the amateur farm to land himself in an awkwardly legal position by turning over the grass-land, which had probably been under grass for many generations, without having obtained the consent of, or indeed having thought it worth while to consult, the landlord. A clearly understood agreement will cover all risks and prevent disagreeable disputes of this kind.

So far, however, from any restrictions as to the cropping of amateur farms being general, the rule is rather that the amateur may crop and manage the land in whatever way he deems best. And this is in reality quite in consonance with what may be called the principle of amateur farming, which, if not carried on for the purposes of some systematic experimenting in various styles of culture and stock management, at least is generally taken to for the purpose, more or less distinctly avowed, of carrying out some "fad" or notion, if not more than one "fad" or "hobby."

This diversity in the style of farming constitutes one of the great features of amateur farming. The amateur, as a rule, has for his main object the gratification of a desire to be engaged in work of the kind, with probably some notion, more or less vague, that if he does not make it pay he will be able so cleverly to manage its details that the loss will not be great; possibly he may be able to "make both ends meet." While there always remains a solid fact to reconcile him to a method of conducting this mode of farming, which in its chief characteristic may be, and is usually, quite antagonistic

to the stern principle with which his own business—if he be a business man—is conducted, and in which profit must be looked after, this namely, that if his own health be not improved by the open-air exercise, which even the most happy-go-lucky style of farming necessitates, that of his family will almost certainly be, living as they will do at the farm and breathing its air, which will be purer, even in the least favourable locality, than that of the city or its suburbs in which paterfamilias may carry on their calling. Further, there is always another fact which tends to reconcile the amateur farmer in carrying on a business by which he "gains a loss"—that his own dreams and those of his family will be realised in a wealth of pure milk, rich golden butter, smelling, as good butter does, "like a posy," fresh eggs, tender chickens, and possibly home-cured hams and bacon, crowned with no end of vegetables from the amateur farm-garden proper, which always forms or ought to form one of its carefully conducted features.

All this makes the diversity in style of farming which we have alluded to almost one of the necessary features or compelled concomitants of the amateur farm. And we shall proceed to explain in treating of the practical details of farm work, that this diversity of practice—which "regular farmers," as they are called, not seldom smile at, and for which some of them express supreme contempt—overlies or is dependent upon a principle calculated to secure great success in amateur farming. Important as we shall see this principle to be, it is, to say the least, rather suggestive that its application to farms of the ordinary or business kind should have been so completely, certainly so generally, overlooked. And this more especially when we consider the exceptionally bad times through which farming has passed of late years, and the poor paying future which, according to many, seems to lie before it.

This feature of diversity in the style of amateur farming, while it undoubtedly adds to the interest of its practice, may, as we have just hinted, in accordance

with a principle yet to be explained, be worked out in such a way that amateur farms may be made to be more than merely health or pleasure-giving—that is, be made to pay. But apart from this point, to which a wealthy amateur may be profoundly indifferent, there is another direction in which this diversity in style of practice may be made to serve a purpose which carries with it practical results of great importance in the progress of scientific farming. To an explanation of this a few sentences may be very usefully devoted.

For some years past the agricultural world has been more or less agitated with a thorough discussion as to the practical value of "experimental farms." These are proposed to be established in different parts of the country on the model, and carried on after the fashion, of the experimental farms on the Continent, specially those of Germany. Of those Continental experimental farms, we have heard much, but a somewhat closer inspection of their number, extent, and especially of the work done in them, would, we suspect, reveal the fact that a much higher rank both in conception of plan or system, and in work they actually do, has been given to them than the facts of the case actually warrant. This praise of high efficiency has been given to them, or has been the result of circumstances which are obvious enough to those who know the subject, but which it is unnecessary here to detail. It is enough for our purpose to say that while beyond all doubt they have done good service in elementary points of great value in scientific agriculture, it is very clearly open to doubt whether they have shown to any great extent very practically how science can be applied directly to the details of ordinary farm practice. We have a parallel position of affairs in the schools established on the Continent for the purpose of giving technical education in connection with various branches of industrial work other than that of farming. Those schools, numerous as they are—though by the way we may remark they are not to be met with in numbers quite so large as some enthusiasts in praise of what Conti-

nental people have done in this direction appear to suppose—are efficient up to a certain point, but are not so efficient as is popularly supposed in implanting knowledge directly applicable to the requirements of workshop and manufacturing practice. The truth is, that in those schools more attention, as a rule, is given to the higher branches of scientific inquiry than to those broad outlines of important principles which have at once a direct bearing upon actual work. Refinements in scientific investigation, and the pursuit of the higher branches of scientific knowledge, are acquired by but a very few; and there are in truth but a very few competent to grasp and master them, and perhaps fewer still who occupy the social position and possess the wealth and means necessary before this close study can be given. These remarks apply in the highest degree to many of the experimental farms established on the Continent, to which indeed the title of Schools of Agricultural Chemistry would be more appropriately and accurately given.

What the advanced agriculturists in this country now advocate is not experimental farms so limited in extent and so narrow in the limits of their work that the term farm can scarcely, at least with little practical accuracy, be given to them at all, but farms which in the character of their work are practically ordinary farms. Those, therefore, would perhaps have their aims and objects best indicated in the title of "ordinary farms experimentally conducted." The great difficulty to be encountered is that of finding funds ample enough to do justice to the working of such farms. This difficulty is so great that with the present adverse circumstances under which farming is placed in all districts of the kingdom, there seems no reasonable hope that it will be overcome. In view of this it has been suggested, that if all the advantages of special farms experimentally conducted could not be fully, they might at least be partially, and yet quite practically, secured if farmers in different parts of the kingdom would devote a certain portion of their live stock to the purposes of certain experiments conducted under the auspices and

scientific direction of leading agricultural societies. Those scientific directors, as they might be termed, might thus belong either to the leading agricultural societies already established, or to a new central association, having branches throughout the kingdom specially founded and supported by subscription for the purpose.

Such work as is here indicated, so far as experiments on actual every-day business farms are concerned, has, in fact, been carried out largely during the last thirty, we might almost say fifty, years; so largely and efficiently, that by far the most practical examples of what science has done for farming are to be found recorded in the pages of our leading agricultural societies as having been done by practical farmers on their own farms and at their own expense. What wealth of practical knowledge is lying enshrined, so to say, in a host of "papers" known only to those who have had the duty imposed on them to become acquainted with all that has been made public from time to time, or whose inclination and leisure have permitted them to keep *au courant* with all the advances of scientific practical farming! Those papers are all in one way or another more or less valuable, many specially so, while a few have carried with them such points of high practical worth that they have revolutionised in some departments our practice, or have indicated new methods of working.

But while this has to a large extent been done, and is still being done, and although such valuable points in practice have resulted from it, the system scarcely meets the necessities of the case; otherwise we should not find that proposals are now being made to establish experimental farms in the way we have noted.

And it can scarcely be expected that those who are engaged in the daily work of farming should be willing, even if they are able, to devote much of their time and go to great expense in carrying out experiments. For in times such as those we have passed through of late years, and are now passing through, and in prospect of those which, in the opinion of so many, are not to be brighter in the future, farmers as a rule have

enough to do to hold their own, and have difficulties in the doing of this quite enough to engage their attention, and have neither the time nor the money to spare to devote to experimental work. For it must be remembered that if experiments succeed and pay in more senses than one, giving an immediate and fair pecuniary return for the money they cost and the time they demand, they often also fail. And even when they do *not directly fail may sometimes take a long period* before they show results which are satisfactory and trustworthy. But it must be understood that the lessons to be derived from failures may be just as valuable as those from successes.

And even when farmers under ordinary circumstances are willing to devote time and money to carry out experiments, while they do this readily enough when they do it of their own accord, they may not do it so readily when asked to do it by some public body. That body having certain objects in view, would of necessity demand or require a certain definite course to be taken; and he who to please himself would tie himself to conditions of his own, would be likely to take a very different view of the matter when the conditions under which he would experiment were dictated by others. At the same time, if the general circumstances of farming were more prosperous and encouraging than they are, or are for some time at least likely to be, we have no doubt that many farmers would gladly lend themselves to the purposes of scientific agricultural societies or committees, who had in view the determining of certain important points in agricultural economy by certain well-devised experiments.

But if assistance of this kind is not under the circumstances of farming persevered in as a business likely to be given so heartily and widely as the importance of experimenting demands, the same objections do not hold in the case of amateur farmers, who farm not to live by it, but to please themselves or gratify a desire for rural life and work. It would add greatly to the interest of their "toy farms" if they devoted part of

their time to the carrying out of such experiments as might be recommended to them by such bodies as we have alluded to. Some amateur farmers have indeed done good service to the science of agriculture by conducting carefully-considered experiments. And that many more will yet be disposed to do this work none need doubt. But much time and money may be thrown away in work of this kind simply through lack of a knowledge—first, of what kinds of experiments are most likely to be useful, and secondly, from an ignorance of the best method of conducting them. For while some amateur farmers possess not only a fair scientific knowledge, but a really good practical notion of what farming is, and can, therefore, not only initiate, but well carry out, agricultural experiments; it can scarcely be expected that the majority, connected as they are with callings the work of which is quite foreign to farming, can be capable either to decide what kind or class of experiments would be useful, or how such could be successfully conducted.

We have some hope, therefore, that if the experimental committees of agricultural associations could formulate some scheme for experiments of a useful kind, they would find a goodly area opened up to them by the amateur farmers of the kingdom; and many of them have such a general scientific, though not a special farming knowledge, as to give them a lively interest in the carrying out of such experiments. We are inclined to favour the opinion that, by taking advantage of those facilities which already exist in this direction—possibly also in that of general farms—the benefits derivable from special experimental farms would to a large extent be valuable, and these farms would be more easily obtained than the special farms, to purchase or secure which would involve expenditure, the amount of which is not likely to be subscribed now by farmers generally. And there are no signs of the times visible from which we can derive the hope that Government would see its way to the providing of funds to establish experimental farms on a wide and useful scale. We

may, in the following chapters, under the different departments of farming, be able to point out some directions in which the amateur farmer may experiment with a result which may be of more than interest to himself. One thing is pretty certain, that by thus going out of the mere ordinary routine of farm work, a much higher degree of interest will be given to the amateur farmer.

And this interest, although in some respects of another character, will be gained should the amateur farmer take up a farm which has been allowed to "run down," as the phrase is—that is, one in which good cultivation has been neglected, or of the work of which the farmer was ignorant. For defective farming is not always the result of pure ignorance of what its work is, or how it should be done. The amateur farmer may begin and, for some time, carry on well. But there are some men so constituted that they are most enthusiastic over everything new which offers a fresh excitement. The "new brooms" of such men always sweep clean. But the feeling of novelty dies out; the enthusiasm is no longer felt which was in fact the only inducement for them to do the work at all; they, sooner or later, get tired of the work, and the land itself is "allowed to rest." The circumstances of some amateur farmers may change so that the "means" which they possessed at the time they took the farm no longer exist, or in such a feeble way that with pecuniary difficulties comes almost a necessity to stop all further outlay in connection with the farm. We have known instances where, either from the operation of the one case or the other, or of both combined, the good farming which was commenced soon ceased.

To a man of a different kind from that just named, and placed under easy circumstances as regards money, the taking of an amateur farm which has been allowed to "run down"—in other words, to become deteriorated —will give more real pleasure than one entered upon in high condition. To "improve" is work which is pleasing to the majority of people; and the work of

improvement, even where it may not be the best to be adopted, gives a large amount of pleasure to him who carries it on. Although the work of improvement be slow, as compared with that of other industries in which what is begun to-day may be finished to-morrow, still the result is quickly enough developed. And each step so leads to the other, that the amateur, if he has any taste at all for rural matters, will soon take such a lively interest in the work of improvement that he will find a degree of fascination about it which will enable him to understand something of the enthusiasm which the true farmer has for his work. If the amateur does not realise all this, nevertheless, when the work of improvement is fairly finished, he will at all events have a degree of solid satisfaction in looking at his farm and in comparing its condition with what it was when he first entered upon it. One caution we deem it essentially necessary to give to the amateur farmer under this head, and it is this:—Assuming that the whole of the farm acreage has been allowed to "go down"—and this may be fairly assumed, as he who neglects one part is likely to neglect the whole—the amateur should take up the work of improvement in detail; that is, he should devote his attention to one, and that a limited part, doing the work of this thoroughly before he takes up another part. When we say one part, this is not meant to be taken literally; for while giving his principal efforts to one area, when he has got this into fair condition, there are, so to say, resting-places in the work of which he should avail himself to commence the preliminary operations required to bring another area within the range of improvement. Although in one sense those two may form distinct classes of improving work, they may, in another way, be looked upon as one.

No matter what the plan of improving work may be, let the one point be avoided of taking too much in hand at one time. We confess that a beginner not experienced in farm work is apt to be carried away with the notion that the more he undertakes to do at once

the more quickly it seems to him that he will finish the whole. But this is a mistake. When all, or nearly all, the work of improvement to be done is taken in hand at once, such an indefinite variety of details crop up, that one gets confused with them, and the desire to get rid of as many of them, and as quickly as possible, leads to hurried and careless work. By taking but a limited or comparatively limited area in hand at a time, all this is avoided, and the part is thoroughly well done; and, when once in high condition, it is easy to keep it so. For it is not so easy to work land which is in bad condition, while the ultimate results are, of course, altogether in favour of the improved land.

The same rule of taking in detail the work of improvement of the land applies also, and with equal force, to that connected with what may be called the structures of the farm. Using this term in its widest acceptation, it includes the outlying work of the farm, such as fences, gates, roads, or footpaths, as well as the more important department to which the name of structures is more specially applicable—namely, the buildings of the farm, such as stables, cow-house, piggeries, and the like. If his predecessor in the farm was so careless, so ignorant, or in such difficulties that he allowed his land to go down in condition, the amateur succeeding him need not be surprised to find all the buildings and outlying structures in the same condition of neglect with all its unsatisfactory concomitants as the result.

In such a case almost the very first work of improvement the amateur has to do is to look to his fences and gates, and get them into the efficient condition necessary to the careful style of farming which we, of course, here assume he is most anxious to carry out. It is imperative that the fences be at once put into good order; for, as we shall hereafter see, a very important part of amateur farming carried on in the way most likely to be successful, is the number of separate fields. Apart from this, however, the work is no less essential, for there is nothing which gives such a forlorn, broken-

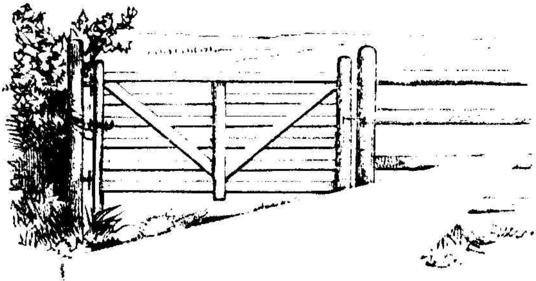
down, bankrupt-like look to a farm as decaying fences with gaps here and there, with gates equally decaying, and in anything but that condition which is so satisfactory every way, and which is indicated by the term "trim." This broken-down state of fences and of gates can be seen by any one at a glance, while it is only to experienced observers that the deteriorated condition of the land itself is known, unless it is overgrown with weeds, and has in a marked manner that deplorably melancholy look which farmers describe as "dirty."

Should the fences display at frequent intervals ugly gaps and broken parts throughout their length, it will be necessary to restore some degree of working efficiency to them by making good the gaps, at least the worst of them, through which stock could make their way, with greater or less ease. And they very quickly make their way through some gaps, which they speedily enlarge. Some, if not all, cows, for example, have a ready way of finding out the weak point of a fence, and a no less ready one for making it into an exit for themselves in search of the "fresh fields and pastures new," which at least some cows seem ever yearning for. Those who study their habits well know that cows are, in more ways than one, very "curious" animals. But this patching-up of unmistakable "gaps" in neglected fences must not be looked upon as the true work to be done. Nor will the amateur farmer—whom we suppose to be one who is proud of his work, and determined to have good evidences of this "pride"— be at all likely to be satisfied with this patching-up of bad work. He will have to do it so that he may get his stock on his land at as early a period of his tenancy as he can; but the patching having this end only in view will give place to, or rather precede, the true work of improvement in this department. This will consist in "beginning at one end" of the work and going regularly on till all the fences show stretches of unbroken lengths, every yard of which is "trim" and "workmanlike," or what sailors would call "ship-shape."

The above reference to fences, although applicable in principle to all kinds, has obviously from the terms used a special reference to timber fences. Where the fences are of iron, if they have been neglected they present the same broken-down, bankrupt aspect which timber fences have under like circumstances. On the whole, indeed, they are even shabbier, and have, in their straining-posts leaning in all directions, with their bent and broken-down stretches of intermediate wires, a specially "hang-dog" appearance when nearly viewed. The amateur farmer proud of his place will not rest satisfied till, "beginning at the beginning" and finishing at the end, he has all his iron fences "taut and trim."

So also with his "quickset" or thorn fences. If he is a "stern reformer," one of those who deem no improvement a thing of fact till the object is so far improved that it has no longer an existence, being "improved off the face of the earth," he will, of course presuming that he has legal liberty to do so, not tolerate the fine old-fashioned fence, with its great bed-wide base, which, as he will be ready to prove, is only a waste of land from the space which it occupies, and a nest for all kinds of vermin—vegetable, insect, and animal—which it harbours. But if the amateur have a taste for rural beauties, and all the charms of a fine old fence, with its picturesque look and its rough-and-tumble base or "bottom," ever the nestling-place of the loveliest wild flowers and the most graceful of weeds, he will think twice before issuing the fiat for its final and complete destruction. Let him keep at least one stretch of this kind of grand old fence, if he be lucky enough to have stretches of it on his farm—and we venture to say that if so he will indeed, in an artistic sense, be lucky. And if he be not himself well pleased at sparing it, which he will be if a man of true rural taste, of this we are sure, that his wife and daughters—Apart if he be blessed with these—will be thoroughly well for there is that such a "thing of beauty" has been spared. ...ugh it be true that these old fences, with

their broad and high bases, do take up much ground valuable in arable or crop culture, and are harbours for weeds and vermin, and cast shadows or make shade under which vegetable growth is scanty, sometimes



altogether ... still, where they skirt or enclose fiel... permanent pasture they have a great val... wn, as they afford snug shelter

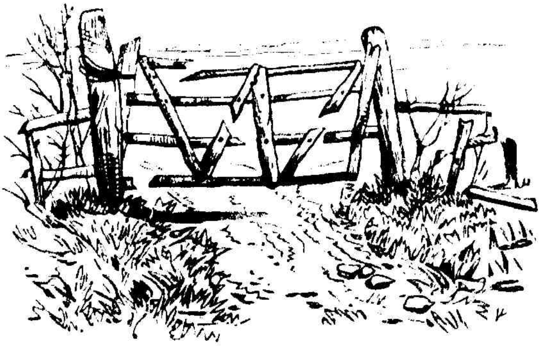


Fig. 2.

to outlying cattle from cold and cutting winds, and from driving clouds of rain or sleet, and the farmer is abundantly repaid by the benefit the stock derive from it. The same shelter, especially those fences bounding

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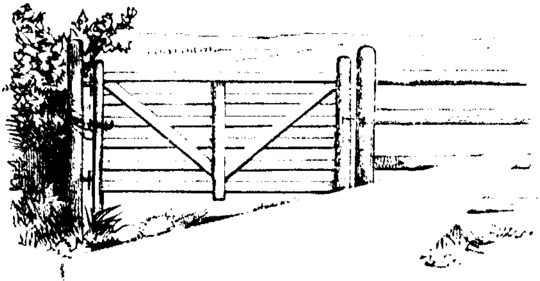

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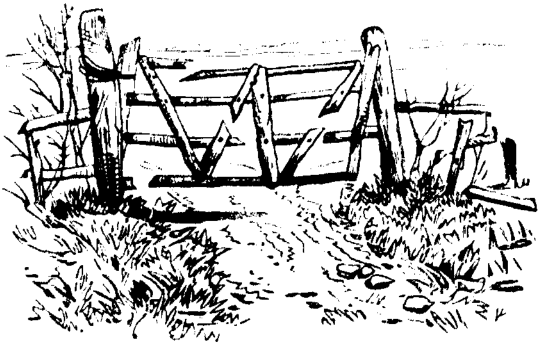

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to outlying cattle from cold and cutting winds, and from driving clouds of rain or sleet, and the farmer is abundantly repaid by the benefit the stock derive from it. The same shelter, especially those fences bounding

the north and east sides of a field, benefits the ground of early and succulent "bites" of pasture grass.

In the case of quickset or thorn fences—and the remark applies equally to those of beech or hornbeam, those two varieties of timber-trees used as fences are so alike in foliage and general habits of growth that it is only experts which can tell the one from the other—which spring at once from the level of the ground, and not from the old-fashioned "hedge-bottom" of soil, nothing looks worse than great, or for the matter of that, a number of small, gaps. Those gaps should be carefully filled up, not with stuffings of thorn, or of gorse or whin branches, but with young plants or quicksets. Here, as in the case of the other fences, gaps may be filled up by such stuffings as above noted. But this should only be for a time. The young plants put in should be carefully guarded on either side of the fence by strong stakes driven so deeply into the soil, and at such a distance from the plants, that cattle may not be able to eat, and finally do away with, the plants, thus practically rendering the gaps still open.

In Fig. 1 on the previous page we give an illustration showing the effect of the well-kept gates and fences of the small farmer who takes as much pride in having everything on his farm in a "ship-shape," orderly condition as he has in cultivating carefully his fields, or attending to the health of his live stock. Fig. 2 gives a contrast to Fig. 1, and we venture to say that the farm on which such a gate or such a fence is seen will be badly cultivated and the stock neglected. In Fig. 3 we give a group of styles of easily constructed strong timber fences, such as are usual on American farms, from which the reader may glean a hint or two of some practical value.

In the case of "stone fences," used in some districts, the style of construction adopted is that known as "dry stone walling," no mortar being used. From the mere length of walls required to divide fields from each other the usual method of construction, in which mortar is used, would be too expensive to admit of this style of

fence being adopted; hence the simpler mode of dry stone construction is usual. This is very quickly carried out by skilful workmen, but is not so easily done by those unaccustomed to it; long practice seems alone

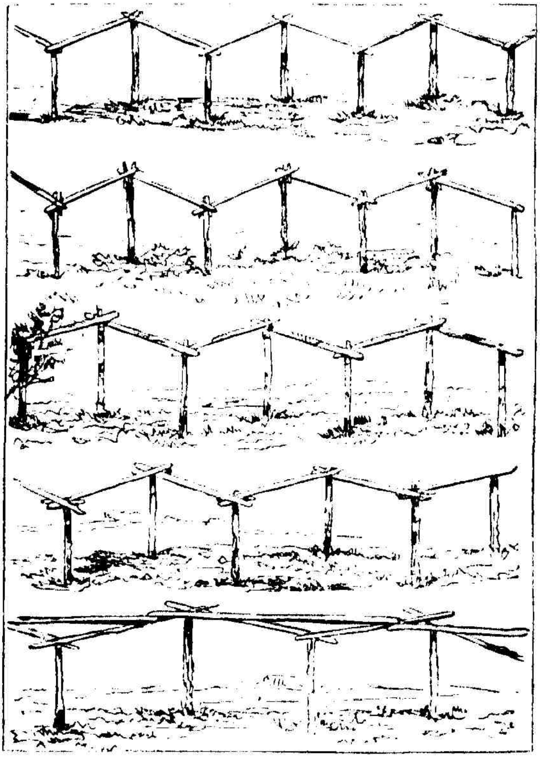

Fig. 3.

to give the ready habit of choosing at a glance the kind of stone to be used, and which will fit in or dovetail, so to say, with others in the wall. For it is on this dovetailing, or interlocking of the stones one with another, that the strength and stability of the dry stone wall

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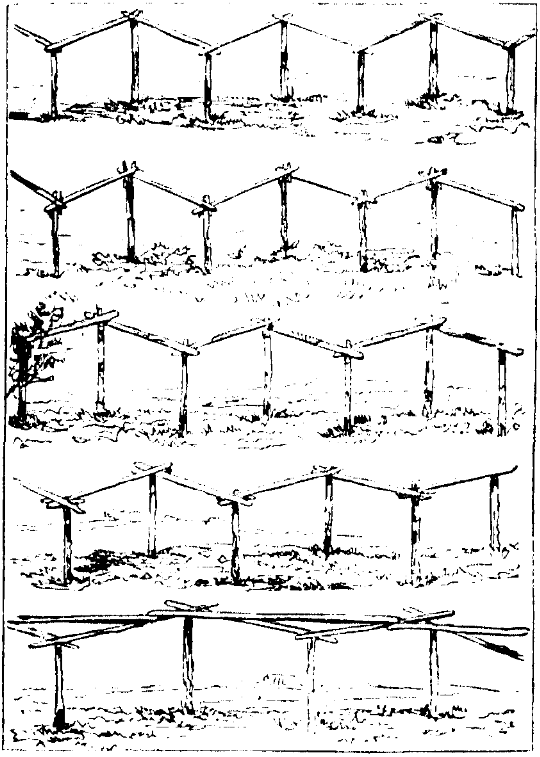

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depends. But the work of the small or amateur farmer in respect to fences of this kind will be confined, as a rule, to repairing; and as the gaps or breakdowns will be generally small in extent, he should have no great difficulty in getting them "made good" either by the ordinary workmen of the farm or by his own skill. The amateur farmer may not have much of this to begin with; but if he possesses even but a little of the spirit of the true amateur who does his work for health or for a hobby, we can promise him some amusement in his endeavours to fill up a gap in a dry stone wall in a ship-shape style. He will find the work as interesting to himself as his young son finds it interesting to put together his toy puzzle. So that he takes care not to work in wet weather, and in all cases to be provided with thick-soled shoes or boots and leggings, we should indeed counsel the amateur farmer, *as a mere matter of healthy exercise, to* take a good deal in hand himself in connection with the repairing of fences and gates. Some have a handy way at carpentering, and plenty of outlet for this will be found on the small farm. Building construction comes under another category, and although quite as interesting in its details as carpentering and joinery work, it is not of the cleanly character which befits the amateur farmer; he who farms for a living must not be so nice, and he may economically and usefully fill up a few odd hours by doing work in repairing all sorts of things which would cost a "good bit" of money if regular tradesmen were called in to do them. For "odd jobs" are always the dearest, and open the door, so to say, for tradesmen to "clap on the little extras," which together make a feature in the account anything but trifling.

As to the roads and footpaths of the small farm, comparatively little has to be said. As to the directions in which they are laid down, and the crooks and bends they should take, the small or amateur farmer must take them as they are, however inconvenient they may be. Very often it happens that one—happy for

the farmer if there be no more than one—of the roads or footpaths is a public one; at least, gives the "right of way" to any one who chooses to exercise it. Such cases give, as a rule, a good deal of trouble to the farmer. This does not arise from people who honestly use the road for proper purposes, but from those who, while using it, take the opportunity, often out of a pure love of mischief, to do a good deal of damage to the farm or to give a good deal of annoyance to the farmer, which is not honest. Such roads give thus not merely a right of way, but, practically, a right of entrance to a man's property which ought, for the sake of its business, to admit none but those who have business with it. The annoyance is all the greater when the road or path giving a public right of way lies through or divides the buildings of the farm into two sections. As tramps and scamps have as good a right to the way as honest people, one of this fraternity but too often takes or makes the opportunity to "help himself to what isn't his'n;" or, if he can't do that, he may not hesitate to do some wanton mischief. And he is all the more likely to do this if he has not had "assistance" at the house at which, no doubt, he has called with his pressing claims on charity.

In such a case, so great is the annoyance, and so completely disturbed the quiet and seclusion essential to a farm-house, that the tenant is well entitled to ask his landlord to turn or divert the road or path so that it shall go outside of the buildings. And should the landlord not be inclined to do this on the score of expense, if the amateur farmer happens to have taken a long lease of the farm, we should be inclined to counsel him to do the work of diverting at his own cost. As the landlord finds the land, so to say, the cost will not be so very great, and the amount thus laid out will be a good investment.

As small and amateur farms are not extensive, the communication from one part to another is to be had by footpaths chiefly; and if there be what may, from its greater breadth, be dignified by the name of a road,

it will likely be only of the simple character known as an "accommodation road." It is scarcely necessary to say that, whatever be the means of communication he possesses, the amateur farmer should take a pride in keeping them in good order. Apart from the inconveniences arising from them, nothing looks worse than to see paths puddled all over in time of wet weather, which, even in dry weather, only get dried enough to keep them in a muddy, spatteringly soft condition; and to walk through mud is perhaps more annoying than to splash through water. And as paths are generally, or at least very often, bounded on each side by hedge fences, and as they are sometimes very narrow, high, and old, the result is that the ground or path surface between them is never so thoroughly dry—save only in exceptionally long-continued dry weather—as to give comfortable and cleanly walking. Puddles, if allowed to form, are liable to extend, so that what at first may be but a small affair in the centre of the path, which admits of being stepped over or flanked, and thus avoided, comes in time, if neglected, to fill the whole width between the fences, so that one has no alternative but to splash through its tiny lake of water or its sea of mud.

No well-kept amateur farm should ever show a condition of things like this. Puddle-holes should not be allowed to form, or if formed before the farmer takes possession, should be filled up. There are various ways of repairing the surface of foot-paths. Much depends upon the way in which the "bottoming," or foundation, of the road or path has been originally made. If good, the keeping of the surface sound is comparatively simple, and consists chiefly in laying down a "surface dressing" of road or path-making materials. Those consist of various substances; but generally for the small path of the amateur farm, if good hard cinders, or what is better, smithy clinkers, can be had, scarcely anything can give so good and dry a surface. In order to the economical repairing or keeping in good condition the paths, the farmer should bear in

mind the lesson taught by the proverb, "One stitch in time saves nine." A narrow and shallow rut or a puddle-hole of small diameter may be filled up and the surface made thoroughly good by the application of a small amount of cinders or other road metal. But they will not be made good and sound, either easily or thoroughly, even by the employment of a large amount of material, if they are allowed to get deeper, or broader, and larger. If hard cinders or clinkers cannot be had easily and cheaply, the amateur farmer may have to exercise his wits in hitting upon some other kind of "metal" for road or path repairing. A gravel-pit may be near his farm, or perhaps be on it; and if in the former case it may be had cheap enough, it is scarcely necessary to say that it should be used, and its use would be thoroughly satisfactory. Almost any hard substance—or substance which in itself may be soft, but which may become hard by converting or being battered down, such as ashes—will give a surface much better even at its worst than one which is allowed to get into and remain in an "eruption of puddles" at its very best. Lacking other materials, if the amateur farmer has a clay soil, or marly clay deposit on part of his farm, he can produce a lot of excellent road-repairing material by burning the clay. Clay, when burnt by means of coal in a clump or heap, forms into a series of small and exceedingly hard nodules, or nut-like pieces; these the farmer will find useful for his roads or paths. But if he be "blessed"—or the other thing—with a clay farm he will find those nodules applied to his arable fields a fairly good thing to use in lightening or opening up his heavy retentive soils, and in helping him, along with his careful selection of crops, to bring it into a state of good *tilth*, and in time convert it into one of the richest, if not in all respects the best, of soils, known as a loamy clay.

While engaged in repairing his roads or paths leading to the fields of his little farm, we should counsel the amateur farmer to think over what he might do in relation to the entrance to his pasture fields—or field, if

he has but one—devoted to the outlying or feeding of his cows. There are but few who have not seen in wet weather the wretched condition of the ground surface *in immediate contiguity to the gate.* This is bad enough on its road side, but on its field side it is so much worse that we have often felt surprised that any one with a fair notion of order could permit it to exist. The cows knowing as well as—better we should say, as they never seem to forget—their attendant the hour at which they ought to be taken out of the field and led to the shippen or house, begin for some time before this to eat their way towards the gate. Arriving at this considerably before the time at which the attendant comes for them, they keep walking or standing and poaching over the surface of the field near it, till it becomes a woeful mass of mud, which often extends far into the field. There is not only thus a loss of grass, but the animals do not gain anything in being allowed to stand ankle-deep in watery mud.

The courtyards of the farm building are generally paved with square or round sets of stone, such as granite, trap, or greenstone, or other hard stone most conveniently to be had in the neighbourhood. Round sets of a small surface, or large pebbles, are also very frequently used for the floors of stables, cow-houses, and stock buildings generally. They are durable enough, but they give a very inconvenient and uncomfortable form of floor when animals are housed in the apartments. They not only give a very treacherous footing, especially when damp or wet, but they afford spaces between them in which dirt easily and quickly accumulates, and which can only be dislodged by a care which most farm labourers grudge, and do not think it necessary to give. We have rarely seen a stable or shippen (cow-house) of this kind as clean as it ought to be; and when it was, we discovered that the cleanliness had been secured only by a drilling of the men, which few masters care to have the trouble to do, or from an inherent love of order and cleanliness in the servants, of which very few are possessed.

The smoother—in the sense of being free from hollow spaces or depressions and awkward corners—the floor of the stock-house is, the more easy it is to be kept clean, and the less absorbent the surface is of liquid the more healthy is it likely to be. As a material giving both of these floor essentials we know of none equal to —or in fact at all approaching it in value—Portland cement concrete. It is equally valuable for the open courts and for the side paths surrounding the buildings of the farm-house, or those leading from one part to another. And in all cases it is so readily available that the work of laying down floor and path surfaces with it, or giving a waterproof floor and sides to liquid manure or to rain-water tanks, can be done by any common farm labourer with very little in the way of instructions, and that little within the comprehension of an ordinary intelligence. The reader interested in the uses of this Portland cement concrete, and how they can be practically worked out, will find various points discussed in one of the chapters connected with the "ensilage" process of preserving green-cut farm crops as food for live stock.

We have now run over the principal points to be attended to in putting a neglected amateur or small farm into good working condition, so far as what may be called the mechanical or constructive features of arrangement. What the farmer will have to do in the way of bringing the fields into good cultural condition comes under quite another department of work. What the details of this are will be best discussed under the different heads or classes of remarks in which the characteristics of ordinary farm crops and cropping are named and treated of. What has had to be said here refers only to what may be called the preliminary work to be done in the case of neglected fields.

The most obvious, and to the incoming tenant of a small or amateur farm the most distracting, result of the neglect of his predecessor is what, in the technical language of agriculture, is called the dirty state or condition of the land; in other words, the weeds of all

kinds with which it is infested. And those will be found not merely in the meadow or pasture land, but in the arable crops. Indeed, all over the farm wherever a weed can find soil to grow in, it will be almost sure to be met with. For the farmer who is careless to get rid of weeds in the case of his crops to which they do so much damage, is not likely to get rid of them in places where there is no apparent damage to be done. We say apparent, for although weeds in those outlying places do no direct injury, they do it indirectly, and that persistently and powerfully; for weeds have a wonderful power of propagation, and those which are allowed to grow in fences and along the sides of roads and pathways will soon spread to the fields. It is difficult, indeed, to over-estimate the loss sustained by agriculture through the weeds which are allowed to grow by the wayside, in odd nooks and corners, or in the more open space of the farm. And it is certainly a matter for serious consideration that a good farmer who has his fields clean and free from weeds, will sometimes allow the weeds to grow freely elsewhere, the seeds of which are scattered by various means broadcast over his fields or in their vicinity, and the evil results of those which propagate themselves by the roots are spread far and wide.

With weeds the amateur farmer must wage a perpetual warfare. They never cease from aggressing, and not the least surprising thing to him will be the ease with which weeds are, so to say, cultivated as compared with the difficulty he finds in raising his crops. After all, we may some day find a use for the weeds which grow so freely, and see in this only an exemplification of the fact that weeds are simply things in the wrong place, and not in themselves worthless or bad. All weeds which are propagated by seeds are remarkable for the number of flowers they produce, and the great number of the seeds which are carried in the ultimate seed-pods. Hence the origin of the proverb, which conveys a pregnant lesson to the amateur farmer, "One year's seeding is seven years' weeding." This

is only another way of saying that if you allow a weed to grow till its seeds ripen, those of the one year will be sufficient to give plants, or weeds, so numerous that it will take seven years' weeding work to get them out of the land.

There is no better evidence of the utter incapacity of a farmer to understand the first essential elements of his business, than his allowing weeds to grow freely. And while many farms are models of what clean cultivation should be, it is, we fear, but only the literal truth to say that the great majority of farms of the kingdom are so cultivated—or not cultivated, in the proper sense of the term—that a very large loss of crop is experienced every year. If this were shown in a clear statement of the pecuniary loss incurred by it, the general public might conclude that possibly by attention to this matter of clean cultivation—this war with and against weeds—the losses of farmers, of which they have heard so much, might have been at least somewhat lessened. If then the annual loss, which beyond doubt is caused through weeds taking possession of the *soil which should grow crops, could only be stated in* figures, the amount would be somewhat startling. The mere fact that weeds are abundant seeders shows that they rob the land freely of that which should go to produce crops, for it is the seed which exhausts the soil of its fertilising constituents.

And in proportion to the extent to which they rob the land of its fertilising constituents—whether these be naturally present in the soil or be added to it in the form of farmyard or artificial manures, they take from this supply that which ought to go to increase the yield of the crop proper. Some fields may be found to have been so wretchedly ill cultivated or so completely neglected, that when the amateur farmer takes possession of his little farm he may find them in such a condition as regards weeds that they would seem to have taken possession of the soil instead of the crops, which they ought properly to bear. We have seen a field of wheat so infested with the red

poppy weed—the "rose-a-ruby," of our forefathers—that the field presented the appearance of a complete carpet or covering of red, the wheat or crop proper appearing only as patches at intervals. The red poppy (*papaver rhosus*) is such a free seeder—each plant bearing on an average one hundred flowers, and each flower producing no fewer than five hundred seeds, or fifty *thousand for each* plant—that when it once has complete possession of the soil in the way mentioned, it increases each season so enormously that the crop proper has no chance of yielding what it ought, with good cultivation, to give.

The "rose-a-ruby," which, however beautiful as a flower, is not precisely the crop the farmer wishes to cultivate, although in very truth it would appear to be so, judging from the number of the poppies which flaunt their bright colours in the summer air. The only way of dealing with a field infested with it is to put it under a succession of what is called cleaning crops, which admit of hoeing and stirring the soil between the plants, thus giving an opportunity to get rid of the weeds. Or, if the land should happen to come under a wheat or grain crop, in the regular rotation or course, the amateur farmer, instead of sowing the seed broadcast, should sow it in drills. And so long as the height of the corn-plants admit of it, the hoeing and clearing process should go on, thus getting rid of the weeds as fast as they come up. Even after the plants proper attain a height too great to admit of hoeing, we should recommend the amateur farmer to send in hand weeders to pull up all the poppy-plants about to flower and thereafter seed, even at the risk of injuring the plants proper. For, in truth, no injury done in this way by the weeders can equal that done by the weeds they should be so careful to pull up. The great point is to prevent the weeds from reaching the stage of seeding; for this not only largely robs the soil directly of its fertilising constituents, but by the plants shedding their seeds adds infinitely to the very mischief which the weeding is designed to get rid of. A good plan of

cropping a field so thoroughly infested with weeds as we have indicated, would be to sow the land down in autumn with winter rye, or rye and vetches, allowing this to grow sufficiently high in the spring, so that a good cutting of green food could be had for soiling or stall-feeding of stock, or for the ensilage process (see succeeding chapters for a description of this food-preserving system). When this is taken off, the land should be ploughed, burying all the green-stuff, weeds included, thus giving the soil what will be a "green manuring." The weeds will, after a short time, appear in great numbers; the surface should then be well harrowed, and a seed sown down either of summer rape or mustard, which, being quick-growing crops, will give a cutting, or even cuttings, of green food which will afford an abundant supply of green stock at a season when food supply is sometimes short. Or a crop of white turnips may be taken, which, if sown in drills, will allow of the warfare against weeds to be kept up till the autumn, when the field will be occupied or treated according to the rotation or course.

In strong soils especially, the weed which is the scourge of the fields is that known popularly as the "couch," or "twitch," or "dog" grass (*triticum repcus*). This does not, like the poppy, propagate itself by seed, but by each root sending out lateral shoots or rootlets, in the same way as the strawberry sheds out its shoots and extends over and through the soil; each shoot becomes a new plant, it again sending out its rootlets; and this is so rapidly done, that it does not take long for a field to be quite overrun with this weed. It is exceedingly difficult to eradicate it from the soil, as, like the wheat-plant, which belongs to the same family or group of plants, it sends its roots very deeply into the soil; and being a reticulated or jointed-rooted plant, it unfortunately happens that the cutting or severing of a root or rootlet by either the plough or the spade, in turning over the soil, in place of killing the plant, only serves to increase its propagating power, inasmuch as each divided root gives for each new part

a new plant; so that the more the roots are divided or cut up, and left thereafter in the soil, the more numerous do the ultimate plants become; and those roots, sending up shoots, appear as the too well-known "dog" or twitch grass, which, in many cases, so take possession of the soil, that it may be said practically to so overpower the crop proper, that the yield of this is reduced to a minimum. The only way, therefore, to deal with the "twitch," after it is cut up by the plough or the spade used in turning over and preparing the soil for a seed-bed, is to get the roots and rootlets out of the soil. To allow them to remain in is simply to increase the number of the plants. And on this point it is surprising what an amount of ignorance exists amongst farmers, and even gardeners, where the latter is presumed to be the best cultivator of the soil. It might be said, indeed, that the great majority believe that, if in ploughing or digging the land, and thus turning up or dividing the weed roots, they can only "turn in" and bury them in the soil, or cover them up, that they will be killed; at all events that they are practically disposed of, and, being out of sight, are out of the way of doing mischief. How erroneous this view is we have seen. So far as gardening is concerned, we can always gauge the actual knowledge, or *per contra* the ignorance, of a gardener of the true principles of his art by the way he deals with his weeds. A thoroughly good gardener never buries or covers up the weeds brought up or divided by his spade. He invariably takes them up and throws them aside, to be carefully removed afterwards, and either burnt or put into the manure-heap. This may appear a tedious and unnecessary process to some; but the time apparently lost is in reality gained, for there will be an infinitely less amount of after-weeding to be done, while the garden crops will be just so much the richer.

This principle or this system also holds good in the preparation of a soil for a seed-bed under the ordinary process of farming. In practice the mode of carrying it out is of necessity different, as in ploughing the

weeds cannot be lifted up and thrown aside. But in spade husbandry they can, and we believe that the highest value is given to this mode of preparing the soil, simply through the facilities it affords of getting rid completely of such weeds as are turned up by the spade. When the plough is used the harrow must be carefully and patiently used also, going over the ground repeatedly till all the weeds turned up by the plough are dragged up by the harrow, collected together, and taken off the ground to be burned. They should never be added to the dung-pit or manure-heap, as is too often done. There they simply keep as a rule fresh, ready to be started into vigorous life when put into or under soil along with the manure. The great rival of the plough is the grubber or cultivator; and it is just one of the great arguments in favour of the latter implement that it brings the weeds to the surface in place of burying them in the soil as the plough does. So infested are some fields with the "twitch" or "couch grass"—and this is most frequently the case in strong and heavy soils, which are most congenial to its growth—that the only way to get rid of them is to place the field in a naked or summer fallow; that is, not to grow any crop upon it, but, during the summer months, to keep up a perpetual warfare against the weeds by harrowing or grubbing at intervals. This clearing of the soil has also this great advantage, that it helps to bring the close and heavy soil into a condition of fine mould or "tilth" so congenial to the growth of crops.

Turning now to the condition of his pasture and meadow fields, or his "grass-land," the amateur farmer will not seldom find, to his surprise and disappointment, that he is taking possession of fields which, although called "grass" might, with a nearer approach to accuracy of description, be termed "weed" land—so numerous are the latter and so completely do they dominate. This will be most generally observable in the case of the meadow-lands, inasmuch as those, unlike the pastures, are not entered upon, but are left undisturbed to grow as they will.

Of the weeds which infest grass-lands the chief, and those which assume the greatest prominence if allowed to grow freely, are the dock and the thistle. It is difficult to say which is the worst in point of injuring the grass crop—that is, in reducing its value—or which is the most difficult to extirpate. To do this effectually and in the quickest way there is nothing left for it but to pull each plant fairly out of the ground. But this quickness is only relative after all, for it is actually a very slow process; and this not only because each plant has to be dealt with individually, but so effectually and effectively dealt with that the whole of the root shall be taken out of the ground. This will appear to be an easy thing to do to those who associate with the dock and the thistle the characteristics of the common weeds of the garden—as tufts of grass, of groundsel, chickweed, dandelion, &c., which, if the soil be in anything like good condition, may be pulled bodily up "root and branch" with ready ease. But the dock and the thistle are weeds of quite another habit of growth; they are tap-rooted like a carrot; but a carrot is an easy thing to extract from the soil compared with the dock or the thistle, for their tap-roots descend much farther into the soil, and take a much firmer hold in it; so firm is the "grip" it takes that a powerful arm, even if the hand could take a grip of the prickly thistle firm enough, will fail to bring the whole root up. So difficult, indeed, is the pulling up alike of dock and thistle by hand, that an implement known as the "dock spade" is used where the operation has to be done effectually.

When one considers the extent or area of a small field, and also the number of those weed-plants which infest some fields, an idea of the labour thrown upon the small or amateur farmer who is determined to get rid of them may be guessed at. But in this, as in all other cases, if the work is to be done labour must not be grudged. And every true farmer will be ashamed to see his lands greatly infested with the dock or thistle, or both of them—and both are met with in all neglected fields.

One can scarcely suppose that there are many farmers like the "old Cheshire blade" whose geese were so invariably swans that nothing was in his farm but what was of the very best, and whose thistles even—and they were in forests in his fields—were like those of no one else; so good of their kind were they that, as with evident pride in having *such* thistles, he remarked, "dang 'em, they growed like trees."

The labour of getting rid of these pests, especially in the case of the dock, is made much more easy—fortunately for the small farmer who has not much labour to give or time to spare if he gives it himself—by the method of completely extracting or pulling out the whole plant, tap-root and all. It so happens that all broad-leaved weeds are supported by, or "fed," so to say, through the medium of the leaves. Hence the efficiency of the method of getting rid of them by "mowing them down." If this mowing down of the upper growing part of the plant be done persistently, that is frequently, so that as soon as any growth appears it is done away with, the roots will gradually lose their vitality and ultimately die out; and what that vitality is, those only know who have had much to do with weeds of the kind we are now writing of. This mowing down may be done with a small and light garden scythe or by a sickle, the last-named implement being perhaps the most readily used in the case of thistles; or a bill-hook may be employed. But whatever be the appliance used to effect the cutting-down, it must be, as before stated, persistently carried out. It is only by repeated attacks that the enemy will be conquered, and this it must be if the farmer wishes to make the most of his grass-lands.

It is surprising to what extent some farmers will allow their lands to be infested with weeds, and of the two we have named, perhaps the dock is that which is the most frequently met with; and they are allowed to keep such quiet possession of the land, that having invaded a meadow, about haymaking time, great patches of dull red will indicate their presence. Fortunately

for the small or amateur farmer, good general cultivation will greatly tend to keep down weeds; and in this direction the power of judicious manuring is very great. There are some artificial manures which seem to have a most salutary effect in getting rid of the dock To those we shall in proper place duly allude.

But even should the amateur farmer have the good fortune to get possession of his grass-lands in a good "clean" condition, that is, free from weeds, it by no means follows that either his pasture fields or his meadow-land will be worth much in yielding what he requires in the way of nutritious or valuable food. In this, as in other departments of work, the principle involved in the well-known French proverb—"There are faggots *and* faggots"—applies. For there are grass-lands *and* grass-lands; that is to say, some are made up almost wholly of "grasses" of the poorest or least nutritious varieties; the good grasses being very few and kept down by the poor ones, which will somehow assert themselves with the power and persistency for which moral evils are at times distinguished. The only remedy in this case is to have the fields sown down with a mixture of good grasses. These "renovating mixtures" require to be supplied with great care and good judgment. For certain grasses, however good in some soils, will not be equally good in others; while the character of the field—that is, whether it is used as a pasture or as a meadow for haymaking grasses—must also be taken into account. The best thing for the amateur farmer is to get an "expert," or some neighbouring farmer who really knows the subject, to examine the fields. If this be done at the proper season he will be able to tell at once in what condition the fields are as to the character—the feeding value—of the grasses which are growing upon them. And if the amateur farmer is thus made aware—which is much more likely to be the case than not—that his grasses are, if not positively the worst, certainly not the best, he cannot in such a case do better than put himself in the hands of one or other of our first seedsmen, who will supply him

with a renovating mixture; care being taken on the part of the amateur farmer that he supplies them with the fullest information as to the soil and general circumstances of the fields he wishes to be improved.

We come now to the *Implements* for the amateur and small farm.

As before stated, I think that for small farms the spade culture gives the best results, and is, on the whole, the most easily carried out. The implements of such farms, therefore, will be comprehended under the brief list of spades, forks, hoes, and dibblers; but in many farms, in which, although still classed as amateur farms, the extent of land is very considerable, a wider range and more pretentious class of implements and machines will be required. It will be well here, then, to illustrate some of the best-known and most highly esteemed.

PLOUGHS.—Ploughs are divided into two classes, "wheel ploughs" and "swing ploughs," of the first of which we give an illustration in Fig. 4. Each kind

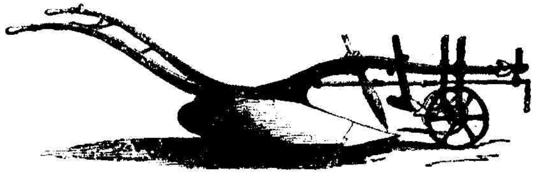


Fig. 4.

has its advocates. The wheel plough is used generally in England, the swing in Scotland—although, in the latter country the wheel plough is daily becoming more used. To those desiring to study the question of ploughing, and the respective merits of the different kinds of ploughs, we may be permitted to refer the reader to the undermentioned work,* where the whole subject is fully

* "The Book of Farm Implements and Machines." By James Slight and Robert Scott Burn, Engineers. Edited by Henry Stephens, F.R.S.E., author of the "Book of the Farm." Blackwood and Sons, Edinburgh and London.

gone into, and most profusely illustrated. The illustration, Fig. 4, now given, represents the plough manufactured by the very celebrated makers, Messrs. J. and F. Howard, of Bedford.

An exceedingly useful implement for a small farm is that invented by the well-known "Sigma," and introduced by him under the name of the "Multum in Parvo." This implement is constructed on the principle of having a number of implements attachable to one frame. There are five implements, so to speak, in one. Fig. 5 gives a general view of the implement,

Fig. 5.

with all its fittings. In Fig. 6, the arrangement of the upper drawing in the diagram shows how the implement can be made into a "subsoil plough." The lower figure illustrates the form of "expanding broadshare." In Fig. 7, the upper drawing shows how the

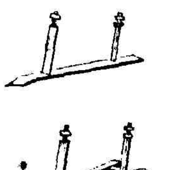


Fig. 6.

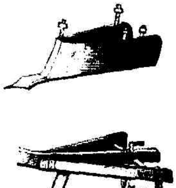


Fig. 7.

implement can be transformed into a "double mouldboard or ridge plough;" the lower drawing illustrates the form of "horse-hoe, or deep stirrer." The mode of using these implements will be described in the Calendar of Farm Operations, forming the last chapter

of this work. The agent for their sale is Mr. Powell, Ticehurst, Sussex.

HARROWS.—The forms of harrows are, it may be said, innumerable. I select for illustration that manufactured by Messrs. Howard (Fig. 8), known as the Simplex harrow. A form known as the steel chain harrow, invented also by Messrs. Howard, will be found useful in brushing in top-dressings, employed on meadow land, for covering grass-seeds, and for preparing wheat-land previous to rolling. The office of the Simplex

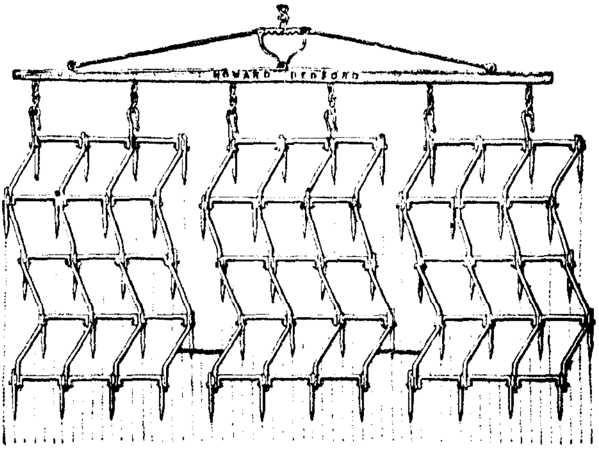


Fig. 8.

harrow, Fig. 8, is to reduce the clods and inequalities of the soil, and to make a finer surface; to bring out and collect the weeds, and to cover the seeds. For many of the purposes of the small farm, a "bush harrow" will be found useful. The farm man, if he have any *nous*, will easily make one with two battens and a few branches of thorn from an old fence. The length of the battens forming the head of the harrow should be about four feet, and the thorn branches the same. A rope should be nailed to each end, the two ropes being

joined in the middle, forming the means of dragging the bush harrow over the surface.

CULTIVATORS, GRUBBERS, SCARIFIERS.—A very useful class of implements is introduced into modern agriculture and known under these three designations. Their object is to open and pulverise the soil, and eradicate the weeds. The best-known form is that manufactured by Mr. Coleman, of Chelmsford.

HORSE-HOE.—In another department of field-labour. namely, the cleaning of and freeing from weeds the land between the rows of drilled corn, &c., this implement has created as great a revolution as the clod-crusher has in the heavy clay soils in reducing them to a fine tilth. The horse-hoe owes its introduction to the mechanical genius of the well-known firm of Messrs. Garrett and Son, of Saxmundham, Suffolk.

SOWING-MACHINES.—I have already adverted to the use of the hand dibbling machine invented by Sigma. Of this an illustration is given in Fig. 9. The manu-

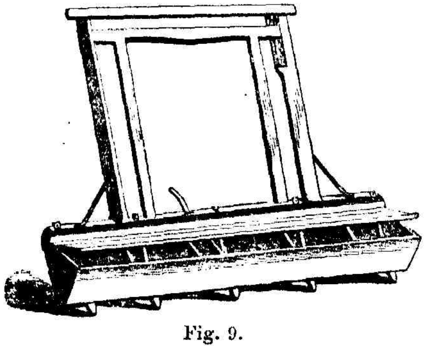


Fig. 9.

facturer of this, Mr. Powell, of Ticehurst, Sussex, gives with each machine purchased a description of the mode of using it. In Fig. 10 an illustration is given of a turnip and seed-drill, which will be found very useful in sowing seed in drills, uniformly and expeditiously. This implement may be obtained from Messrs. Richmond and Chandler, Salford, near Manchester.

HEY-TEDDING MACHINE, AND HAND-RAKE.—Where the extent of land under meadow is considerable, it will pay to have a tedding-machine; the hay by this will be "got" very much more quickly, and in better con-

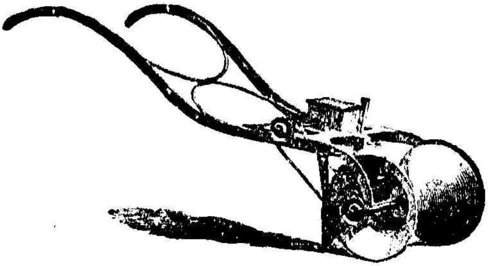


Fig. 10.

dition than when got by hand alone. A well-known form is that manufactured by Mr. W. N. Nicholson, of Newark-upon-Trent.

A useful implement in the hay-field will be the hand hay-rake, manufactured by many implement makers.

Fig. 11.

Buildings.—As a rule these will be already existing when the farm is taken, and all that the amateur can do is to insist upon their being in good repair, however faulty their arrangement may be. As re-arranging on more conveniently working lines involves pulling down and re-building a building *de novo*, there is comparatively little chance of the ingoing tenant having his wishes in this respect gratified. If the farm becomes the absolute property of the amateur he may then carry out his "hobby" to its fullest extent, in which case

Fig. 12.

we should counsel him to try to erect buildings which will be at the least "pretty and pleasant to look upon," if they should have no great pretension to architectural design. The sketch we give in Fig. 13 on the following page may yield him a hint as to how easily pleasing effects are to be obtained in buildings for our live stock at no great expenditure of costly building materials.

As regards cottages which may be on the farm, occupied by the servants of the amateur farmer or by other

tenants, however poor these may be in design, he can at least insist upon them being kept, with all their surroundings, in the best of order. In respect of the house of the small farmer, the same attention to order should be observable in it and in all which surrounds it. And just as we can predict with the utmost certainty that we should be right in concluding that a small farmer who keeps his gates and fences in the condition indicated by the sketch in Fig. 1 is a bad and unsuc-

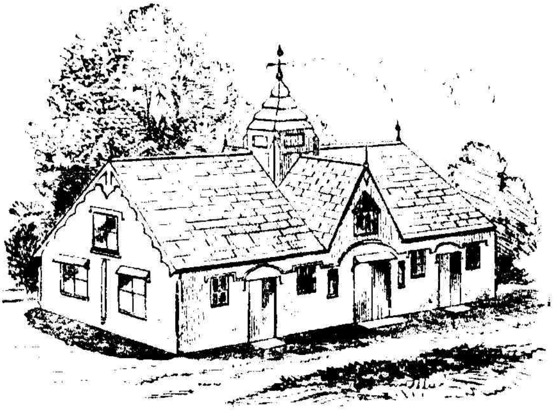


Fig. 13.

cessful farmer, so also may the same conclusion be arrived at if one sees his house in something like the condition indicated in Fig. 11. Contrast this with the sketch in Fig. 12.

Fig. 13 is a view showing how the whole of the buildings necessary for the amateur small farm may be concentrated under one roof, with a design which, while it is not too pretentious or too ornate, still gives in its *tout ensemble* what would be an ornamental feature in the grounds.

CHAPTER XII.

ABOUT SUNDRY MATTERS OF THE SMALL FARM.—SOIL.—ROTATION OF CROPS, ETC., ETC.

LET me, at the outset, warn those of my readers who contemplate taking a small farm to avoid having anything to do with a tenacious clay, of the bird-limy in rainy, and of the "brick-bricky" character in warm sunny weather. It is unfit, in my opinion, for the experimental character which should be the prevailing feature of an amateur farm; for its working will always be attended with a series of vexatious difficulties quite sufficient to disgust one who follows farming for the love of the thing, or the gratification of a whim or hobby. For a graphic account of the difficulties attendant upon the cultivation of a tenacious soil, I would advise the reader to consult Talpa's* "Chronicles of a Clay Farm" (Longmans). For sparkling epigrammatic writing there is nothing like it in the whole range of agricultural literature, and it shows what genius can do to throw around what is generally considered a dull and dreary subject all the charms of style and interest. It reads like a novel, and the racy illustrations of Cruikshank add to the zest with which it is perused.

Let the amateur, then, if possible, get possession of a soil of a rich loamy character, in which, by the exercise of ordinary care, all the usual farm crops can be cultivated. It will add wonderfully to the interest of his "wee farm" if a wide variety of crops are raised; and it will be a disastrous season indeed which causes all crops capable of being grown on the farm to be failures.

* The *nom de plume* of Chandos Wren Hoskyns, Esq., a name well and favourably known to agriculturists.

After deciding upon the soil, the next point to be arranged is *rotation*, to which I beg now to direct the attention of the reader uninitiated in the mysteries of agricultural science. This subject it is essential for the amateur farmer to know about, at all events, in a general way. If we grow year after year, in the same soil, a succession of the same seed or crop, the produce, which at first was good, gradually deteriorates, till at last the soil refuses to bear the plants longer, or at least it produces them only in a most degenerated and worthless condition. Hence we find in farming the necessity for securing a perpetual succession of crops, never growing the same crop on the same land two years in succession. Several theories of *rotations* have been promulgated, but the last expounded, that which is most generally received, I shall alone describe. Each plant, it is assumed—for the whole subject is in anything but a well-defined condition—extracts from the soil the "food," so to speak, which is best fitted for its growth, leaving other foods for which, if I may so express it, it has no use remaining in the soil. Repeated growths, then, of the same plant upon the same soil would ultimately exhaust the supply of the food which it requires to insure its healthy and productive growth. By changing the crops, the "food" which is left in the soil by one is taken up and used by another. This change consists, in practice, in having green crops to follow grain crops; broad-leaved root-plants following narrow-leaved cereals. By this means all the constituents supplied to the soil by the manuring agents applied to it are taken up by the succession of roots and cereals grown on it. The fertility of the soil might be maintained to raise a perpetual series of crops of the same plant by the judicious and regular application of manure to it; but if the theory of rotation be accepted as above stated, it is evident that this mode would assuredly result in loss; inasmuch as the plant, always drawing one set, so to speak, of constituents from the soil, would leave all others supplied by the manure *in* the soil; so that, in process of time, an accumulation

of fertilising matter would be the result, costing a considerable amount.

"The necessity for a rotation," says Professor Anderson, in the "Transactions of the Highland Society," "has been usually attributed to different crops removing different inorganic constituents from the soil. Thus certain plants require for their luxuriant growth a large quantity of potash, and they must be followed in the rotation by some other plant which does not extract that element from the soil, or at least only in a comparatively small quantity; and each individual crop can only be successfully repeated when, by the lapse of time, a sufficient quantity of its characteristic constituents has been liberated from some inert form of combination, in which it exists in the soil," and I may add, or supplied in the form of manure, as "farm-yard," which contains all the constituents of plants; or of "artificial" manure, which is designed to supply a special fertilizer to the soil. As already stated, however, nothing very definite is known on the subject of rotations, much conjecture and assumption being mixed up with its consideration. As suggestive that the notion that "different plants remove different inorganic constituents from the soil" is not quite correct, it is worth stating that no great difference between the ashes of the various plants is shown by analyses. Again, some maintain that the soil contains such an exhaustless supply of the food of plants, that there is sufficient in it for a constant succession of crops.

Rotations of different kinds are found to be practised in different parts of the country, modified according to circumstances of soil and locality. They may be divided, however, into two classes—1, "Rotations for the light;" and 2, "For the heavy land." A rotation for light land, known as the "four-course," or Norfolk, is as follows:—1st year, green crops; 2nd year, barley (with which is sown clover); 3rd year, clover or grasses; 4th year, wheat or oats. An arrangement followed will be exemplified by the following simple tables:—

FIRST YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.
Green or Root Crops.	Barley with Clover or Grass Seeds.	Clover or Grass.	Wheat.

Table 1.

SECOND YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.
Barley with Clover or Grass Seeds.	Clover or Grass.	Wheat.	Green or Root Crops.

Table 2.

THIRD YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.
Clover or Grass.	Wheat.	Green or Root Crops.	Barley with Clover or Grass Seeds.

Table 3.

FOURTH YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.
Wheat.	Green or Root Crops.	Barley with Clover or Grass Seeds.	Clover or Grass.

Table 4.

Table 1 shows the land to be cropped as divided into four plots, with the arrangement of its crops for the first year, turnips opening the rotation; in Table 2, the arrangement of the second year's crops, Plot No. 1 now bears barley; with this clover or artificial grass seeds are sown, which are allowed to remain after the barley is harvested; and from the crop of Plot No. 1 in

the third year's plan, as shown in Table 3, the grasses are succeeded by wheat, which closes the rotation and occupies Plot No. 1 in the fourth year's plan of cropping. Taking Plot No. 2 in the first year's plan, it is seen to be occupied with barley, in the second year with clover or grass, in the third year with wheat, in the fourth year with green or root crops. Throughout the rotation the barley (sown down with clover or grass seeds) follows the green or root crops; the clover (or grass) follows the barley, the wheat follows the clover (or grass), and the green or root crops follow the wheat. The fifth year is the same as the first. But complete as the alternation of green with grain crops appears in this rotation, perfect alternation is only effected where the green and grain crops themselves are changed; different varieties of each occupying the same plot in succession. Thus, when any plot which in any one year was occupied with a grain crop, as wheat, again falls to be occupied with a grain crop, it should be barley and not wheat; the third occupancy being again changed from barley to oats, the same care being taken to alternate the green crops. Thus, let Plot No. 1, Table 1, be occupied with turnips in the first year; for the fifth year, when the rotation begins the second time, the crop in Plot No. 1 should not be turnips but mangold-wurzels, beet, or kohl-rabi; in the ninth year, when the rotation begins the third time, the Plot No. 1 should be occupied with potatoes; in the thirteenth year, when the rotation begins for the fourth time, Plot No. 1 is now to be occupied with what is called a forage-plant, as rape, vetches, cabbages, &c.

Plot No. 1. First year.	Turnips.
Plot No. 1. Fifth year. **Second time of rotation.**	**Mangold-wurzel or Kohl-rabi.**

PLOT No. 1. Ninth year. Third time of rotation.	Potatoes.
PLOT No. 1. Thirteenth year. Fourth time of rotation.	Rape, Vetches, or Cabbages.

The above is a plan of the alternation of green crops in Plot No. 1 during the period of the rotation; the following gives the corresponding alternation of the grain crops (see Table 1):—

PLOT No. 4. First year.	Wheat.
* PLOT No. 4. Fifth year. Second time of rotation.	Barley.
PLOT No. 4. Ninth year. Third time of rotation.	Oats.
PLOT No. 4. Thirteenth year. Fourth time of rotation.	Rye.

When the land under culture is of small extent, and none of it desired to be under grass or clover, from there being a sufficiency of meadow-land and pasture-ground, a four-course rotation may be adopted as follows:—

FIRST YEAR.

PLOT No. 1.	PLOT No. 2.	PLOT No. 3.	PLOT No. 4.
Beans.	Wheat.	Root or Green Crops.	Barley or Oats.

TABLE 5.

the third year's plan, as shown in Table 3, the grasses are succeeded by wheat, which closes the rotation and occupies Plot No. 1 in the fourth year's plan of cropping. Taking Plot No. 2 in the first year's plan, it is seen to be occupied with barley, in the second year with clover or grass, in the third year with wheat, in the fourth year with green or root crops. Throughout the rotation the barley (sown down with clover or grass seeds) follows the green or root crops; the clover (or grass) follows the barley, the wheat follows the clover (or grass), and the green or root crops follow the wheat. The fifth year is the same as the first. But complete as the alternation of green with grain crops appears in this rotation, perfect alternation is only effected where the green and grain crops themselves are changed; different varieties of each occupying the same plot in succession. Thus, when any plot which in any one year was occupied with a grain crop, as wheat, again falls to be occupied with a grain crop, it should be barley and not wheat; the third occupancy being again changed from barley to oats, the same care being taken to alternate the green crops. Thus, let Plot No. 1, Table 1, be occupied with turnips in the first year; for the fifth year, when the rotation begins the second time, the crop in Plot No. 1 should not be turnips but mangold-wurzels, beet, or kohl-rabi; in the ninth year, when the rotation begins the third time, the Plot No. 1 should be occupied with potatoes; in the thirteenth year, when the rotation begins for the fourth time, Plot No. 1 is now to be occupied with what is called a forage-plant, as rape, vetches, cabbages, &c.

PLOT NO. 1. First year.	Turnips.
PLOT NO. 1. Fifth year. Second time of rotation.	Mangold-wurzel or Kohl-rabi.

Plot No. 1. Ninth year. Third time of rotation.	Potatoes.
Plot No. 1. Thirteenth year. Fourth time of rotation.	Rape, Vetches, or Cabbages.

The above is a plan of the alternation of green crops in Plot No. 1 during the period of the rotation; the following gives the corresponding alternation of the grain crops (see Table 1):—

Plot No. 4. First year.	Wheat.
Plot No. 4. Fifth year. Second time of rotation.	Barley.
Plot No. 4. Ninth year. Third time of rotation.	Oats.
Plot No. 4. Thirteenth year. Fourth time of rotation.	Rye.

When the land under culture is of small extent, and none of it desired to be under grass or clover, from there being a sufficiency of meadow-land and pasture-ground, a four-course rotation may be adopted as follows:—

FIRST YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.
Beans.	Wheat.	Root or Green Crops.	Barley or Oats.

Table 5.

SECOND YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.
Wheat.	Root or Green Crops.	Barley or Oats.	Beans.

Table 6.

THIRD YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.
Root or Green Crops.	Barley or Oats.	Beans.	Wheat.

Table 7.

FOURTH YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.
Barley or Oats.	Beans.	Wheat.	Root or Green Crops.

Table 8.

This rotation is adapted for a clayey, or what is sometimes termed a wheat soil. The rotation illustrated in Table 1 may be modified and changed into a "five-course," thus:—

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 5.
Barley.	Grass.	Second year in Grass.	Wheat.	Root or Green Crops.

A "seven-course" rotation may be arranged as follows:—

FIRST YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 5.	Plot No. 6.	Plot No. 7.
Root or Green Crops.	Barley with Grass Seeds.	Grass Mown for Cattle.	Grass for Pasture.	Oats.	Beans.	Wheat.

SECOND YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 5.	Plot No. 6.	Plot No. 7.
Barley with Grass Seeds.	Grass Mown for Cattle.	Grass for Pasture.	Oats.	Beans.	Wheat.	Root or Green Crops.

Table 10.

THIRD YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 5.	Plot No. 6.	Plot No. 7.
Grass Mown for Cattle.	Grass for Pasture.	Oats.	Beans.	Wheat.	Root or Green Crops.	Barley with Grass Seeds.

Table 11.

FOURTH YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 5.	Plot No. 6.	Plot No. 7.
Grass for Pasture.	Oats.	Beans.	Wheat.	Root or Green Crops.	Barley with Grass Seeds.	Grass Mown for Cattle.

Table 12.

FIFTH YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 5.	Plot No. 6.	Plot No. 7.
Oats.	Beans.	Wheat.	Root or Green Crops.	Barley with Grass Seeds.	Grass Mown for Cattle.	Grass for Pasture.

Table 13.

SIXTH YEAR.

Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 5.	Plot No. 6.	Plot No. 7.
Beans.	Wheat.	Root or Green Crops.	Barley with Grass Seeds.	Grass Mown for Cattle.	Grass for Pasture.	Oats.

SEVENTH YEAR.

PLOT No. 1.	PLOT No. 2.	PLOT No. 3.	PLOT No. 4.	PLOT No. 5.	PLOT No. 6.	PLOT No. 7.
Wheat.	Root or Green Crops.	Barley with Grass Seeds.	Grass Mown for Cattle.	Grass for Pasture.	Oats.	Beans.

TABLE 15.

In the tenacious, bird-limy clays, where root-crops cannot well be cultivated, a very different rotation is followed. An amateur farm, as I have in the introduction to this chapter stated, should never be taken where the soil is of this kind. It is totally unfit for the diversified experiments and modes of working competent for the amateur farmer, and which in my opinion constitute so much of the real charm of a play-farm, bringing as they do with them the delights of change and of novelty. Moreover, where a variety of crops are cultivated, it will be a strange thing should any season, however unfavourable, result in the loss, or great deterioration, of all the crops. The circumstances detrimental to one may not be so to the other. Although advising the reader to avoid having anything to do with neglected, tenacious, clayey soils, it will be well, seeing that one of the aims of this little work is to convey a general notion of the principles of agriculture, to give —while on the subject of rotations—one used in these heavy, tenacious clays I speak of.

In these the "fallow" takes a place. Some of my readers may be curious to know what is meant by this term. In the early times of agriculture, when the crops cultivated were few in number, and were, of course, frequently repeated, it was discovered that after a time the soil refused to grow the crop, or at least to grow it well. It was therefore allowed to remain at rest for a period, no crops being grown upon it. This portion of land so treated was termed "fallow" land. After resting for some time, the cropping upon it was resumed, the fertilizing properties being found restored

to it. At first the fallow was allowed to remain absolutely at rest; but in process of time, the advantages of stirring the soil, opening it up to the atmospheric influences, and getting rid of the weeds, became more evident; the fallow land, therefore, during the summer-time, was subjected to repeated ploughings and workings. At one period in the history of agriculture, the "fallow" formed a part of every farm; but the introduction of the "root-crop" into this country from Flanders brought about such a complete revolution in the system of cropping, that in the lands to which the roots were adapted, the "fallow" was gradually abolished, and the whole soil of a farm was engaged in bearing crops, no part of it being allowed to remain idle. This arose from the facilities afforded by the root-crops for introducing a change of crop on the same soil, to make use of—so to speak—the "food" left in the soil by the preceding crop. The roots, moreover, being highly manured, and grown in lines, placed at such a distance apart as to allow of the soil being stirred, and the weeds removed from between them, during a long period of their growth, the land was as thoroughly prepared for the grain-crop which succeeded the roots as if it had lain fallow. Indeed, so complete in many soils are the advantages of the fallow secured by the cultivation of roots, that they are sometimes termed "fallow crops." Of course, in localities where tenacious, heavy clays are met with, unsuited for the growth of roots, the fallow will form part of the rotation there adopted, as will be seen from the following:—1st, Fallow; 2nd, Wheat; 3rd, Beans or Clover; 4th, Barley. It is right, however, to mention, that from the introduction of machinery, improved processes of working, and a judicious use of manures, many heavy lands are being made capable of bearing root-crops.

The introduction of a rotation depends, of course, upon the nature of the soil; but for all soils between the lightest and poorest of sands and the heaviest and most tenacious of clays, the rotation in Tables 1 and 5 will be found generally to answer. The heavier the

soil, the more frequent should be the workings to which it is subjected; a light soil, on the contrary, should be worked less frequently, and, indeed, often requires consolidating. Where sheep are fed, one advantage of the rotation I have given for light soils is by feeding the turnips off the land with the sheep, as it is at once manured and consolidated. As the turnip and the clover are apt to degenerate when grown too frequently on the same soil, it is advisable to change the kind of grain or root-crop, as before recommended. Rape, vetches, Italian rye-grass, may be substituted for the clover; and kohl-rabi, parsnips, or cabbages for the turnips.

Laying out and Culture of the Land for Crops.—In setting out the land of his little farm, designed to grow the various crops in the rotation adopted, I would strongly advise the amateur farmer to mark out several plots in which one or more of the crops of rotation can be cultivated in a variety of ways, and to which a variety of manures can be applied. By doing this I can safely promise him an almost endless variety of pleasures. The mere planning of the experiments, with the carrying out of them, keeps the mind very pleasantly engaged, and is a valuable relief to one who may be occupied in some other way which confines him for hours to sedentary work, or keeps his mind continually on the rack by the demands of a commercial calling or professional pursuit, as I presume will be the case with the majority of amateur farmers. You are perpetually looking forward, moreover, to the period *when* the experiment will be resolved, and cannot help putting forth all sorts of anticipatory thoughts, and broaching conjectures as to *how* it will be so. You have, in fact, all the excitement of a pleasant lottery without its disadvantages; for, like the original game of "heads, I win; tails, you lose," the game in any case is in your hands; for if the experiment succeeds, you gain an increased or more valuable crop; if it fails, you gain experience, and perhaps an insight into some curious process of nature, which before was unknown to, or even undreamt

of by you. We all have heard of, and I dare say we have nearly all of us experienced, that wonderful impatience of youth to know whether the process of growth has commenced of seeds which they may have put into their tiny gardens, and of that prying curiosity to know how it goes on which prompts them to scratch them up before they show their green points through the brown earth—impatience and curiosity very delightful to the youthful mind. I do not promise to the amateur who may plant out seeds in a new way, or manure those with a new substance, the same degree of delightful anxiety which the youth has; but I can at all events promise him some considerable proportion of it, and that is worth something in these "used-up" days, when almost everything is pronounced to be empty and to have "nothing in it." When his own special day's work is over, I will venture to say that his "man" or "men" will not seldom see him strolling down to the field where his "experimental plots" may be situated, and bending over or walking round them with an interest which will, I fear, elicit anything but complimentary remarks as to his good sense or practical wisdom from such man or men. For be it here mildly suggested, that such an invincible repugnance has an ordinary specimen of the genus "agricultural labourer" to all improvements, or innovations which may be considered such, that nothing will convince him but that they are the veriest folly, and, in consequence, that he who attempts them is not much blessed with wisdom.

For instance, when I have been engaged putting in seeds in a certain plot, and in a certain way, I know well enough that a guffaw, which is borne on the breeze across the field, comes from my two men, who are working in the opposite corner, and has arisen in consequence of one of them quietly resting on his spade, in the lazily luxurious way known to most masters who have had experience in paying gardeners and labourers for this sort of thing, looking at me and asking his neighbour, "What on earth is he about now?" for in such a respectably complimentary way does he talk

of me. But I know that it is not specially myself personally whom he treats with such scorn, but simply the fact that I am the representative of a change in practice; and all change is utterly repugnant to many phases of the labouring mind. When I took my "play-farm," it was, of course, with a view to carry out on it all sorts of "audacious" experiments; so when I engaged "my man," my head-man, if I dare assume such a dignified title, and so designate one of my small establishment, I frankly told him that I would ask him to do many things which he would, I knew, consider very odd. If I did this by way of preparing him, taking off the "chill," as it were, I might have saved myself the trouble, for if I had warned him every day, he never would, I verily believe, have divested himself of the strange look—half defiant, half sarcastic—with which he received my announcement of some *new* things which I wished done. The little scenes which were enacted on such occasions greatly amused me, I confess.

I remember well my first effort at explaining a new process. William and another man were busy taking up mangolds in a field over which I had been somewhat idly strolling—doing, in fact, the easiest part of farm-work, namely, looking on and ordering. I went up to them and commenced my explanation. At first, the look which I learned to know so well took possession of William's face; but so utterly unlike to anything in his experience was the process I was explaining to him, that it gradually wore off, and I knew that an explosion of laughter was coming, which it did, and very much to my amusement, too. Honest Bill could not stand the absurdity of my proposed plan—it was too much for him. "Well, measter," he at last said, "I never heard the like o' that afore; it winna do, it winna do, *I* assure you;" laying an emphasis on the personal pronoun, as much as to tell me that my experience was not to be set against his any day. In answer to my explanation that it *would* do, that, in fact, it had done in more cases than one, he came out with what I soon discovered was a stock speech of his, a sort of moral

weapon, so to call it, of his own, with which he firmly, and for once and all, drove home his charge: "Ay, measter, there's nowt like practice." Not wishing further to explain, I of course told him that whether it would do or not it must be tried. This laugh of his at the order to carry out my first "experience," as William, honest fellow, called "experiment," turned, however, a capital argument for me in the long run. "It's a fine thing that, measter," said William to me, one fine frosty morning, as I walked into the shippen, or cowhouse. "What is a fine thing?" I asked. "The new plan, sir." "Why, William," I rejoined, "I think you laughed at it, and said it would not do." "Ay, so I did," he answered, with an easy, off-hand coolness, quite pleasant to see, considering his former scepticism, "but I see now it is a fine thing, a fine thing, sir." I turned that laugh to advantage, and closed up many an incredulous jeer of his by reminding him of it.

It was all very well, however, when "orders" to inaugurate new plans or processes passed thus pleasantly off; but *not* seldom was I grieved to find the existence of a decided obstinacy on the part of the men I employed, an utter lack of sympathy with the projects of the master, and of that workmanlike feeling which takes a pride in seeing improvements go on, and new things tried. This, in fact, is one of the points which bear very closely on the labour question now attracting so much attention amongst those interested in the improvement of the social condition of the labourer. The want of an intellectual sympathy is the cause of the want of social and moral sympathy between master and man, which is so much to be deplored as widely existing—a platform on which both can mutually meet. The master does, and often with the happiest effect, go down to the labourer's platform; but my experience goes to prove that, in the great majority of cases, it seems to be utterly hopeless to expect the workman to rise to that of the master: supposing, I mean, that the master is in every point of view the superior—not always the case I confess. I fear we shall

be able to do but little with the present generation of grown-up labourers. We must begin with the young; our only hope rests with them. I have given my reader this long digression, but with a view to prepare such of them who may be contemplating the carrying on of a "play-farm" what he must expect from his labourers. The more anxious he will be to do his duty to them, the more, in some cases, will the difficulties surround him as to how to do it. It is to be deplored when one's intercourse with one's helper tends to harden the heart towards them, and to deaden true sympathy. But such is too often the case. The labour question is surrounded with difficulties. I make no apology for this digression; the subject of it is too important to be passed over, and the lessons one learns about it are not the least important of the lessons of a little farm.

CHAPTER XIII.

CULTURE OF GRAIN CROPS.—WHEAT.—OATS.—BARLEY.—RYE.—HARVESTING.

I HAVE already said that a vast deal of pleasure is to be derived from having a number of experimental plots at work, so to speak, upon the farm, each one working out a problem, the demonstration of which will be watched with pleasant anxiety. The following plan shows how a series of plots may be laid out for experiments upon different methods of planting and manuring *wheat*, the most important of all our cereals:—

DIVISION IN WHEAT (No. 1, General Plan).

Butt No. 1, sown with (white) wheat (state variety), broadcast, Nov. 5th.

Butt No. 2, do. do.

Butt No. 3, do. do.

Wheat

Butt No. 4, drilled 4 inches apart, Nov. 6th.

Butt No. 5, drilled.

DIVISION IN WHEAT (*continued*).

Butt No. 6, drilled 9 inches apart, Nov. 6.			
Butt No. 7, dibbled with Sigma's dibble, Nov. 6th.			
Butt No. 8,	do.	do.	Nov. 6th.
Butt No. 9,	do.	do.	Nov. 6th.
Butt No. 10, hand dibbled, 9 inches apart each way, three or four grains in the hole.			
Butt No. 11,	do.	do.	
Butt No. 12,	do.	do.	

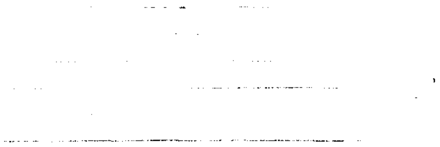
WHEAT (botanical name *Triticum sativum*).—The soil best adapted for this cereal is strong. The crops which usually precede the wheat are the fallow or root-crops, as turnips, potatoes, and beet or mangold-wurzel; or forage crops, as clover. Where the wheat is made to follow the potato crop, this being an exhausting crop, it is desirable to manure the land before sowing the wheat. Wheat requires a consolidated, not an open soil; the roller, therefore, is good to be used where the soil is light and friable. The best crop to precede the wheat is a root crop, as turnips; but where the soil is too heavy to admit of root crops being grown, beans usually precede the wheat. Wheat may be divided into two great classes, "winter" and "spring," and the different varieties classed under two heads, "red" and "white." Wheat is generally sown in the autumn, as soon as the crops which precede it are taken off the ground. Where these are taken off too late to admit

of the land being prepared and the seed got in, the wheat is sown in the spring. The quantity of the seed sown per acre is one to two bushels, according to the notion of the farmer on the subject of "thick" and "thin" sowing; for this it is proper the reader should know is one of the vexed questions of agriculture. Having carefully studied all the arguments, statements, and facts published during the last few years on the subject, and from what I have seen in practice, I am very much disposed to think that thin seeding is the best. In the experience of many farmers, plots or parts of thin wheat-fields which have come up so wretchedly thin as to induce them almost to plough the land up, have turned out the most prolific parts of the field. I had in two plots last year a remarkable exemplification of this. In one of two plots treated exactly alike, and both sown on the broadcast system, the wheat came up exceedingly thin and patchy. My man advised its being sown in the spring-time with barley; but I determined to let it remain, stating that I had no doubt of its turning out as well in point of weight as the other plot. The result justified these expectations, and although the number of wheat-plants was comparatively small, no comparison could be made between the bulk of the ears and the quality of the grain obtained from the thickly-planted plot and the thinly-planted one; the thinly-planted plot giving by far the best quality of grain.

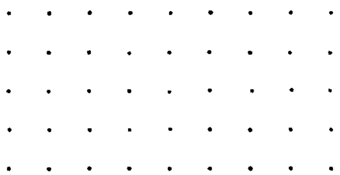
As I suppose the amateur's farm to be small in extent, from five to ten and twelve acres, set out in nicely-balanced proportions of arable land—that is, cultivated land and pasture and meadow fields for hay; and as these fields will necessarily bring down the extent of land under culture to a small proportion of the whole farm, I presume that the spade or trenching-fork will be the means used to prepare the soil for the reception of the crops. All are agreed as to the advantages resulting from spade husbandry; and one reason why it is not adopted on large farms is not because it is not beneficial, but because it is such a difficult matter to

get a sufficiency of hands to carry it out properly. The improvement effected in ploughed land by putting it under spade culture is very great and rapid too. A man should dig an acre of turnip-land or clover-land to a depth of nine to twelve inches in twenty-eight days to six weeks, according to the condition in which it is. Stubble-land should be turned over for about sixpence per square rod. A pair of horses will plough an acre of land in ten working hours.

Wheat is, in practice, sown in three different ways. First, *broadcast*, that is, scattered by hand over the surface of the soil. Second, *drilled*, that is, the seed is continuously deposited in parallel rows, the distance between which is usually six to nine inches:



Third, *dibbled*, that is, the seed is deposited in holes made in the soil, the distance varying according to circumstances:



These three systems have all their advocates; but the reader must judge for himself as to which is the best from the following considerations, which are given by Professor Wilson in his work entitled "Our Farm Crops," p. 31, and which comprises all that can be said on the comparative merits of the three systems. "Broadcasting," says the Professor, "enables the farmer to get his seed in at a quicker rate, and at a less

cost, than by the use of machines; while at the same time in adverse seasons he is less dependent upon the weather at seed-time, and, if his land is kept well cleaned in his fallow crops, he may not suffer much by leaving his crop beyond the reach of the hoe during its period of growth. On the other hand, if his land be foul at sowing, it necessarily becomes worse by harvest-time, and the crop must have been injured, as every weed grown on the surface has abstracted from the soil a certain amount of food, which otherwise would have gone to increase the crop under cultivation. This condition of things soon tells its own tale on the debtor side of the farm ledger, while another item to be entered there is the extra quantity of seed required to be sown. This generally amounts to considerably more than the entire cost of machine sowing.

"*Drilling* offers the great advantage to the farmer of being able to regulate the exact quantity of seed to be sown; to sow it equally all over the field; to deposit it at a given regular depth in the soil; to insure its being properly covered. A saving of seed to the extent of one-third to one-half, as compared with broadcasting, is effected; and by being deposited in the ground in straight parallel lines, great facilities are afforded for keeping the surface free from weeds, either by hoeing or hand-pulling. The produce also per acre is, under equal conditions of soil, climate, &c., shown to exceed that of broadcasting. The only charge that can be advanced against drilling is, that perhaps it offers some assistance to the wire-worm in its destructive attacks on the young plant, by forming a furrow of loosened soil, along which the wire-worm takes its course without any difficulty, destroying each plant in succession. This, however, on soils subject to it, may easily be checked by running a ribbed roller, either Cambridge or Crosskill, across the line of drills, by which the continuity of each furrowed course is broken at each indentation of the roller. The wire-worm then, owing to its small powers of forcing itself through the soil, can only move from plant to plant by coming up to the

surface; this materially checks its progress, while its presence there is being constantly sought for by insectivorous birds.

"*Dibbling* is to be recommended chiefly for the more perfect manner in which the seed is deposited in the soil, both as regards the quality of its distribution and as regards the proportion of area allotted to each plant. The amount of seed saved by this method is an item of consideration—drilling requiring twice and broadcasting four times the quantity. The seed, too, by being deposited in separate unconnected holes, is not so liable to be destroyed by the wire-worm as when sown in drills, while the parallelism of its lines of plants offers even greater facilities for cleaning than in ordinary drilling. Some care, however, is necessary that the dibbling machine should only be made use of when the soil is suitable and in a suitable condition. If it be too light, or too dry, the sides of the holes are apt to fall in with the seed, or before it is quite deposited, and then the depth is irregular, often too little. If the soil is heavy or too wet, the dibble forms a hole or cup, with compressed sides and bottom, in which the water collects, checks the germination of the seed, and materially injures or destroys the vitality of the young plant."

The well-known writer on agricultural subjects, who appears before the public under the *nom de plume* of "Sigma," is a great advocate for the dibbling system, of which he remarks: "All things being equal, whether the soil be rich or poor, light or heavy, drained or undrained, I have found 'set'* wheat succeed better than when drilled or broadcasted, merely because each plant has an even space allotted to it. . . . . I do not mean to say that 'planted or set wheat' does not succeed better on some lands than on others; but what I affirm is, that everything being equal of two pieces of land of equal size, one 'set' with wheat, the other drilled or broadcast, the 'set' land will produce a heavier and more healthy crop, and with straw *always* standing stiff and erect through all weathers." It is,

* By the term "set," the author means *dibbled*.

indeed, this latter result which is one of the most striking of the "dibbling" process.

Last year, the district in which my little farm is situated was visited with showers of an extremely heavy character; so heavy were they that they seemed to dash all the standing grain with wonderful force to the ground. As I had my various plots laid out in grain grown on the three systems, I had an admirable opportunity of noticing which of the three afforded the best security against laid crops. The broadcast crops were uniformly the worst; some of them laid as flat as a table-top; the drilled plots were laid, but laid unequally, some parts standing pretty well; but in all the dibbled plots, without exception, the grain stood erect. But, further, we had a succession of showers extending over a space of many weeks, so that I had an opportunity of finding, roughly or approximately, the relative capabilities of the grain grown on the three systems to withstand the beating or laying influences of continued heavy showers.

On the first heavy shower—I have occasion to remember it well—the broadcast plots were laid in the central part of each plot to a considerable extent; the drilled plots showed signs of weakness, but no decided "laying;" the dibbled plots no signs whatever; but as the "rattling showers" came one after the other, it was curious to note how little by little the broadcast plots were laid hopelessly and helplessly down; soon the drilled plots got to their worst, but they were never so bad as the broadcast plots, the part in the drilled plots which resisted at first resisting to the end; while the dibbled plots were nearly as erect the day they were cut as they were before the heavy rains came on. In the broadcast plots, however, there was one exception, namely that which came up "thin sown;" the wheat in this plot stood erect to the end. In two barley plots I had a striking exemplification of the power of dibbled grain to stand the beating-down influence of heavy showers, as compared with broadcasted; the plot broadcasted was, at a comparatively early period in the

autumn, so completely flattened that it might have been rolled. The seed began to spring anew, and a second growth was forcing its way through the first. The plot dibbled had the holes placed at distances of nine inches, and a single seed in each hole. The stems came up and grew strong and numerous, and resisted all the unfavourable influences of wind and weather.

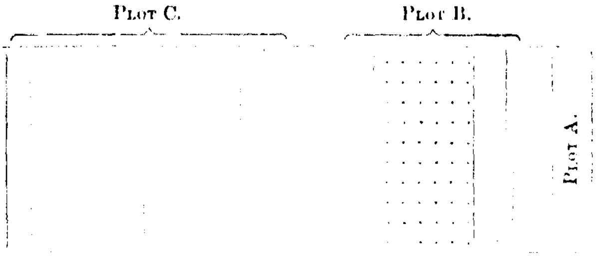
Before sowing the wheat it is necessary to steep it, to prevent the disease called the "smut" attacking it. I use the steep known as "Down's Farmer's Friend." Urine is often used as a steep. The wheat is stirred up in the solution or "pickle," all seeds which float being refused; the wheat is then taken out, well dried, and sown as soon after it is dried as possible.

As before stated, I should advise the reader to lay out several plots with wheat, and in different ways, so that he will have the pleasure of watching their progress and noticing the results at the end of the season. In order that all the stages of the experiment may be traced with ease, and one plot easily distinguished from another, it will be advisable to "plan" out the whole of the land allotted to the crop in a book specially kept for the purpose.

The following will show how I have laid out one of my stetches of land this year for the wheat crop. Thus, see the plot marked in "General Plan of Cultivated Land" in a succeeding chapter, which is marked out in the book, thus:—

Plot D.	Plot C.	Plot B.
Sown Oct. 9, 18—, with New Californian Wheat.	Sown Oct. 8, 18—, with Giant Wheat.	Sown Oct. 4, 18—, with Hallett's Pedigree Wheat.

But in order to know exactly how each of these plots is sown, I map out each plot in a page of the "Farm Work Book" (see a succeeding chapter on "Farm Accounts") under the date of sowing. This I do on a larger scale than the space of the general plan permits of, and the entry stands thus:—



Note (in Book).—Oct. 4th, 18—. Planted Plot B (here the page refers to the page of the book in which the "general plan" is given, and which is mapped out in parts distinguished by various letters) with Hallett's Pedigree Wheat, three feet space between it and Plot A. Six drills, nine inches apart: next, ten rows dibbled, nine inches apart each way, one grain in each hole; then six drills, nine inches apart. Then, as I have shown in Plot C, two plots sown under precisely the same circumstances, and each of which I can place under different manurial treatment, recording under date what that treatment is.

The varieties of wheat I sowed in one year were Giant, Talavera, Hallett's Pedigree, New Californian, Norfolk White Wheat, Browick's Wheat, Fenton's Wheat, Nursery Red Wheat, Drewitt's Wheat, Barwell Wheat, Kingsland Wheat, Chiddam Wheat, Hunter's Wheat, Archer's Wheat. For the experimental stock of each of these I was indebted to Messrs. Lawson & Son, the eminent seedsmen of Edinburgh and London; then, in addition to plots set out and carefully planted with all these different wheats, I sowed one with a mixture of the whole of these varieties. On this point of mixture of seed, Professor Wilson has the following interesting and suggestive note in his "Farm Crops," p. 20: "In the *Journal d'Agriculture Pratique*, for November, 1856, a report is given of some experiments by M. Lucien Rousseau, of Angerville, on the growth of various kinds of wheat, under the same conditions of time of sowing, soil, and climate. There

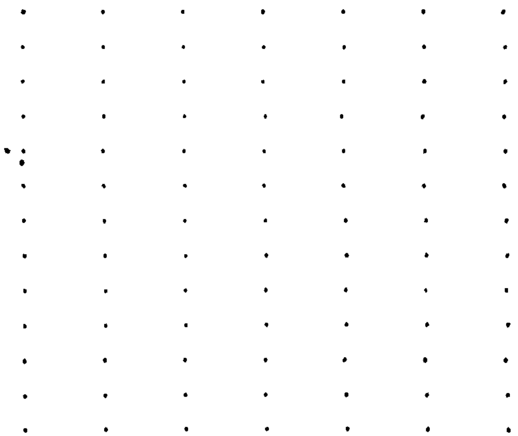
were fifteen lots of different wheats experimented with, and the sixteenth was composed of equal portions of the fifteen mixed together."

Throughout the growth of the plants the mixed lot appeared always to have the advantage, and, at the time of harvest, its produce, both in grain and straw, was considerably in excess of any of the others. M. Rousseau seems to consider the superior produce of the mixed grain to be due mainly to the more perfect impregnation of the floret, by the ears making their appearance at so many different times as there were varieties sown, for if the first flower, he says, which has lost its pollen has not been fertilised, owing to the badness of the weather, it may still be capable of being impregnated by the pollen of a later ear. M. L. Vilmorin, in commenting on the experiments, says: "A mixture of grain, arising from sorts selected as suitable to the district, does not present usually any marked difference in appearance so as to be lessened in value. On the other hand, the increase in yield, and the greater chance of success arising from the variety of different constitutions of the kinds sown, gives the results obtained by M. Rousseau an importance which ought not to be disregarded. By taking care not to mix sorts, the grain of which has not the same market value, and does not ripen at about the same time, it appears that very important advantages may be derived." It is but right, however, to state, that this principle of a mixture of seeds is considered by some wrong. They maintain that to attain to purity of the variety of seed grown is the grand object of culture. As the object of the present volume is not merely to detail what I have done on my little farm, but to point out what others have done, so that the reader may have a variety of experiments to choose from, some of which, if he will carry out, will add greatly to the interest of his farm, I therefore here draw his attention to two methods of growing wheat—one, the first, is that of "selection;" the other, the second, the "Lois Weedon" principle.

The principle of "selection" has been carried out

with singularly marked and good results by Mr. Hallet, of Brighton.

Anxious to add a plot of this famous wheat to my various plots of the year, I applied to Mr. Hallet, who, in a very courteous manner, sent me an ear of wheat, picked indiscriminately from the corn in his barn, and of which I give at *a*—see Frontispiece—a representation (one-fourth less than the actual size), and in addition a small supply of grains. I laid out a plot with this as follows, the date of sowing being so early as September 6th. *Early sowing* Mr. Hallet insists upon as an essential.



Each hole is nine inches from its neighbour, so that there are sixteen holes in each square yard; the depth of each hole is about an inch and a half, and a single grain is deposited in each hole, and the whole covered up. In the plan of the plot which I have entered in my book, I have left sufficient space between each of the holes to enable me to number each hole. Round the dot representing a hole, the seed of which does not germinate, I draw a circle in red ink; and at the end of the season I reckon the produce of each hole, or "pocket," as it is sometimes termed, and place against

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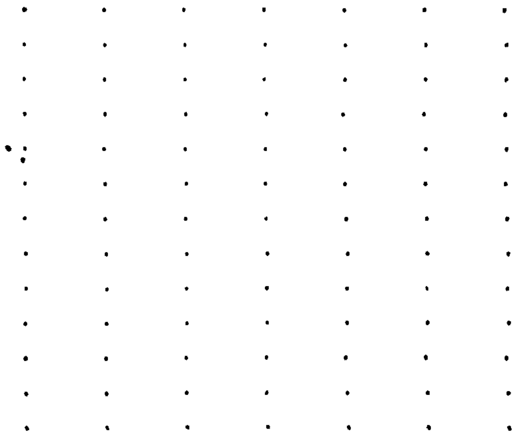

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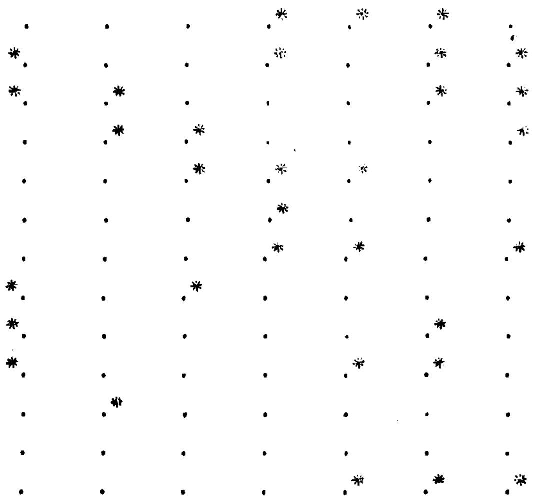
each number in the plan the number of grains produced by it. The best of these will then be chosen, as affording the seed for the next crop.

From some plots of wheat grown on my own place, and top-dressed in spring with nitrate of soda, I obtained some good wheat. Of two ears of this I give a drawing, *b* and *c* in Frontispiece (the scale is one-fourth less than the actual size). I have, on the principle of "selection," sown a plot with the best grains from the best ears; the holes dibbled in at nine inches apart each way, and *one* grain placed in each hole.

It is a disputed point with those who advocate dibbling of wheat, whether one grain, or two or three grains, should be placed in each hole. To test this in a small way, I set out a number of plots from which I obtained the following results. Out of 56 holes dibbled 9 inches



apart, and each hole having 3 grains sown in it, 49 holes tillered. Out of 56 holes dibbled 9 inches apart, and having 2 grains in each hole, 45 came up. Out of 56 holes, with 1 grain in each hole, 32 came up. Out

of a plot of 154 holes 97 came up. The foregoing map of a plot will be interesting and suggestive. Each hole which has missed is marked with a star, thus, *; all the other full dots represent the holes which have germinated.

It is somewhat curious to note the distribution of the holes which have missed. Thus, out of 92 holes, 32 have missed. In another plot, consisting of 104 holes, each having 1 grain only in it, 37 holes only missed. The reader may draw his own inference from the above facts; but in glancing over the various plots, it was easy to see how much more regularly the hole had shot up its sprout or sprouts of wheat where two or three grains had been placed in each, than in the plots where only one had been put in each hole. From what I have heard experienced men say, from what I have read on the subject, and from what I have tried myself, in addition to the experiments above described, I am of opinion that the advantages of thin sowing are to be met to their fullest extent when the plants are placed at comparatively wide intervals, and where the plants are produced from three to five grains rather than from one. This is in the case of dibbling; in drilling, let the intervals be wide between the drills, but the seed moderately thick *in* the drills. I believe that holes 9 inches apart—everything else being equal—will give a larger produce than when the holes are only 6 inches apart. If we were sure of each seed germinating in its hole, as good results might be obtained from one grain as if 3 or 5 were put in it. But there are so many chances against each grain germinating—birds, grubs, &c.—that it is, I think, infinitely the safer plan to put more grains than one. If planted early, 3 to each hole will suffice; but the later sown, the more in the holes will be required; if advanced in November, 5 or 6 will be required.

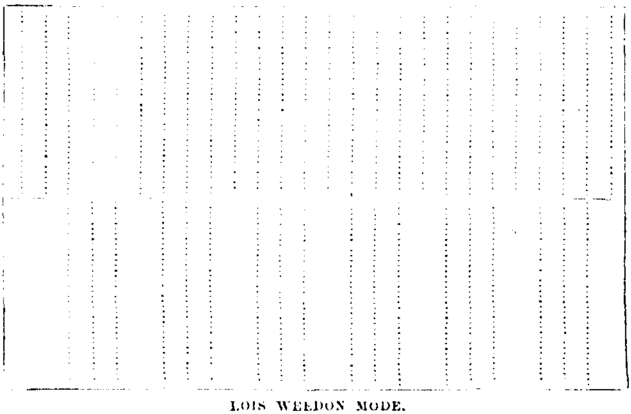
I now come to describe very briefly the system of sowing wheat introduced by the Rev. Mr. Smith, at Lois Weedon Vicarage, and hence known as the Lois Weedon system. The feature of this is leaving fallow

wide spaces between the wheat rows—these being kept up in what may be called a perpetual system of stirring so as to let the atmosphere act on the wheat rows. The remarkable peculiarity of this system is, that wheat is grown upon the same land for a succession of years without manure. The method of culture in this system is described in a pamphlet, "A Word in Season; or, How to Grow Wheat with Profit" —a most interesting *brochure*, to which I heartily recommend the reader's attention. It is published by Ridgway, of Piccadilly, price 1s.

The following diagram gives a fair idea of this system:—

LOIS WEEDON SYSTEM OF GROWING WHEAT, AND THE ORDINARY DRILL SYSTEM.

ORDINARY MODE.



LOIS WEEDON MODE.

In the system of Mr. Piper, of Colne Engraine, in Essex, wheat is grown in a still more remarkable manner, year after year, on the same land, which he never ploughs, digs, or stirs, but merely clears the surface of all weeds, and varies the manures which he applies to the crop, giving one year guano, another year lime, another soot, &c., &c. And of late years the system of Mr. Prout, of continual corn growing, has attracted

great attention. We confine ourselves to the Lois Weedon system, as it is well adapted for the small farmer. Those who wish to become acquainted with the Prout system will find it fully explained in the *Journal of the Royal Agricultural Society of England.*

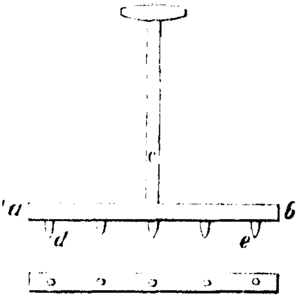
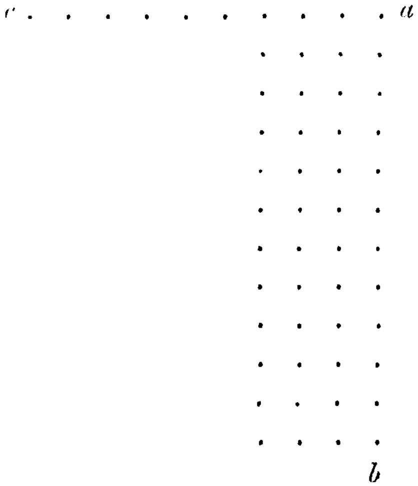


Fig. 14.

The process of dibbling wheat by using a single dibble being very tedious, I use the implement in Fig. 14, in the following way:—I first mark out across the "butt," "furrow," "stetch," or "plot," a line in the direction in which the rows are to run, as in the line *a b*:—



I then take the dibbler, and set it down along the line, pressing the foot alternately on the top of the bar, ***a b***, on each side of the upright bar, *c c* (Fig. 14). This

presses the dibble, *d e*, into the ground; and in withdrawing the dibble, four holes nine inches apart will be marked out in the ground, from one inch to an inch and a half in depth. In the hole nearest the bottom, or end *b* of the row, I place one of the dibbles at *e* (see drawing of dibble), as a guide, and press down the dibble in the line *a b*. I thus proceed till I mark out along the whole length of the end *a b* a series of holes nine inches apart. I now proceed to mark out the holes along the length of butt in the direction of *a c*, as follows:—I place the dibble or point *e* in the first hole of the row *a b*, and keeping the bar *a b* of the dibble along the line *a c*, or as nearly at right angles to *a b* as my eye enables me to do, I press the dibble, and thus obtain four holes in the direction of *a c*. Moving *backwards*, I next insert the point *e* of the dibble in the *second* hole of the line *a b*, and keeping the bar of the dibble at right angles to the line *a b*, I make other four holes in the direction of *a c*. By proceeding thus, always keeping the point at *e* in one of the holes of the line *a b*, I obtain across the butt a series of four lines of holes nine inches apart each way. I then turn round, and, moving backwards in the direction from *b* to *a*, and always keeping one of the points of the dibble in the holes of the inside or last-made line, I gradually go across the butt, and make a series of dibbles in line. *Three* rows of dibbled holes are thus made in each journey across the butt. The operation is not so tedious as one might suppose; in fact, it is sooner done than described. Into the holes thus made the grain or grains are dropped by hand, and covered up with a hand-rake. This dropping is, of course, tedious; but it is surprising how rapidly by a little practice one can mark out the holes and drop the seeds.

"Sigma" has invented a hand-dibbling apparatus, by which the seeds are dibbled in with wonderful accuracy and celerity. It is easily worked, but I have not had such success in its working as to induce me to repeat its use this wheat-sowing season. Many of the plots sown with it last year failed to come up satisfac-

torily. Although *not* to deposit the seed with it is almost an impossibility, still it has one disadvantage, and to which, as my readers may recollect, Mr. Smith, of Lois Weedon, has alluded—namely, you do not see the seed deposited by it. This is the great advantage of the hand-dropping system: you *know* that the grain is deposited. I am aware of the objection made to the hand-dropping system in these days of agricultural machines and of lazy workpeople, who are not to be depended upon for accuracy or honesty in giving each hole its own proportioned grains. But I am writing at present for the amateur, who, I suppose, is likely to do a little of the easy work of the farm himself. Certainly, if he wishes to gain health, and add to the pleasures of his play-farm, I would strongly recommend him to "bend his back" in the fine days of autumn or spring, now and then, and dibble in a few thousand grains.

When there is not a great extent of land to be drilled with wheat, the simplest method is to draw the ruts or furrows with the angle of a three cornered hoe (Fig. 15). The operator will soon acquire dexterity enough

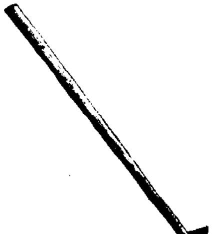


Fig. 15.

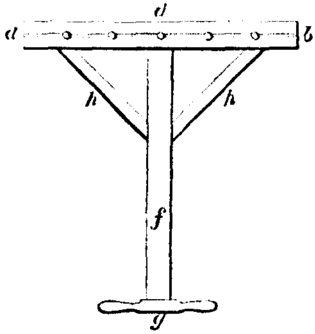


Fig. 16.

to draw the lines parallel and of uniform depth. Where much of this work is contemplated, it will be better to get a simple drilling apparatus made, which a man can easily drag over the land. I here give illustrations of it. Let *a b* (Fig. 16) be of hard wood,

as oak, some four or five inches square, to give sufficient weight to press the iron pointers into the soil as the implement is dragged over the land. The iron pointers may be driven into the under side of *a b* (Fig. 16); but to be securely fixed, they should be passed through holes made in the head *a b*, and secured with nuts on the upper side. The handle *f* is furnished at top with a cross at *g*, and stayed by stays, *h h*. Fig. 17 is a side elevation. To enable the lines to be drawn at *different* distances, an *adjustable* apparatus

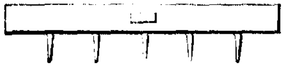


Fig. 17.

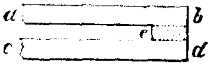


Fig. 18.

may be made as follows:—The head is made in two pieces, as *a b*, *c d* (Fig. 18), and kept apart three-fourths of an inch distant by parts *e*, at the end, as shown. The teeth or tines are made as in Fig. 19, with a shoulder, *a b*, and an upper stud, *c*; this is passed up the aperture between the two pieces, *a b*, *c d* (Fig. 18), and fixed at any point by the nut *a* (Fig. 19). As this is screwed up tight, it jams the shoulder, *b a*, against the lower side of the head, and keeps the tine tight. By loosening the nut, the tine may be slid along the slot as desired; and thus any distance may be made between the tines. Fig. 20 is a cross section. This will be found a very useful implement in the farm for sowing all manner of seeds *in line*.

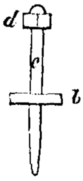


Fig. 19.

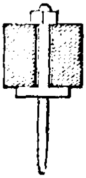


Fig. 20.

A very quick and very simple way of dropping or distributing the seed evenly along the drills, in *small* plots made either with the implement just described or with the three-cornered hoe, is to put it in a long paper envelope—one of those which are made to open at the end—or in a long paper bag, and shake it out as you walk gently along. A little experience will

soon enable the operator to drop the seed uniformly along the line. The seed may be covered up either with the bush-harrow or the hand-rake; the latter is the most satisfactory.

The next crop I have to write about is BARLEY (botanical name, *Hordeum*). As much of what I have had to say about the wheat crop will be applicable to this as well as to the oat crop, my remarks will necessarily be short.

The two-rowed barley (*Hordeum distichum*) is that which is chiefly grown in this country. The soil best suited for barley is a light, rich, and friable one; a wet, heavy soil is not congenial to it. The crop should always succeed a root crop. The varieties most commonly grown are the Common or Early English, the Chevalier, the Annat, the Golden Drop, the Nottingham Long-eared. Messrs. Fletcher, of Sleaford, Lincolnshire, were kind enough to forward me a small parcel of "Healey's Providence Prolific"—a barley recently introduced. I dibbled the seed in holes nine inches apart, and put one grain in each hole. A very small percentage (only about seven per cent.) of the grains failed to come up, and nothing could be more satisfactory than the bushy, tree-like form the plants assumed. From each grain was produced, on the average, 24 ears, and each ear gave, on the average, 24 grains. One plant yielded 43 straws, 32 ears, of which 24 were prolific. The following is a statement of the number of grains in each ear:—

No. 1, 29;	No. 2, 31;	No. 3, 30;	No. 4, 34;
No. 5, 30;	No. 6, 32;	No. 7, 32;	No. 8, 30;
No. 9, 28;	No. 10, 31;	No. 11, 27;	No. 12, 31;
No. 13, 32;	No. 14, 34;	No. 15, 30;	No. 16, 30;
No. 17, 34;	No. 18, 25;	No. 19, 30;	No. 20, 18;
No. 21, 29;	No. 22, 30;	No. 23, 27;	No. 24, 34;

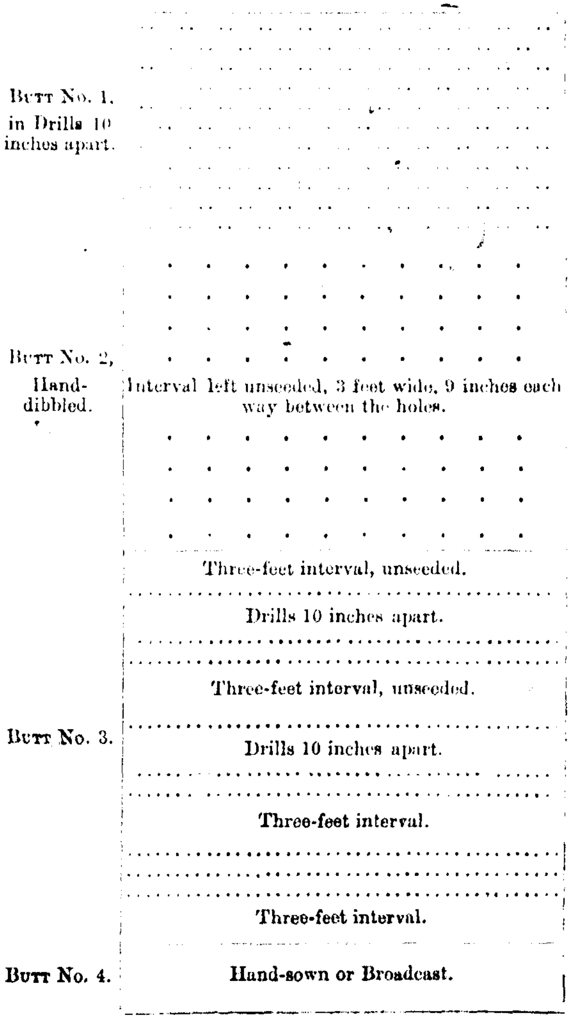
or, in all, 748 grains, as the produce of one grain.

The time of sowing of barley is a disputed point amongst agriculturists, some advocating as early as February; some late sowing, as late as April, and even

May. The balance of evidence seems in favour of early sowing. Much, however, is still to be done in the way of direct experiment on this point. The usual months for sowing are March and April. The quantity to be sowed is also a disputed point, some advocating thin, some thick sowing. Much of what I have said on the sowing of wheat refers as pointedly to that of barley. A usual quantity of seed to sow is three bushels per acre. In sowing, it is necessary, in order to insure the quick germination of the seeds, to have the land in a moist condition. When the soil is freshly turned over is the best time for the seed to be put in. Barley is a very quickly-germinating grain.

OATS (botanical name, *Avena sativa*).—There are numerous varieties of oats grown. Possibly the potato oat is that which is most commonly sown. The Poland oat is a variety generally cultivated in England. The crop may be grown in a wide range of soils; those of a rich loamy character yield the largest results. The preparation of the land for the crop is very similar to that required for the wheat crop. The conditions of growth of both plants are very similar, more so than of barley and wheat. Oats may be taken after a crop of roots or beans; usually they follow the seeds or artificial grasses; sometimes they are taken after wheat, sometimes after the barley. The time of sowing, like that of the wheat or the barley crops, is a disputed point. Early sowing has, however, more to be said in its favour than late. Indeed, one of the remarkable changes in the practice of agriculture that is foreshadowing itself, is the general substitution of early for late sowing of all the cereals. This, amongst other things, is owing to the improved condition of the soil, consequent upon drainage, manuring, and the facilities thrown in the way of working improved machinery. The usual months for sowing oats are February and March; they should invariably be got in before the barley. The quantity of seed is usually two to three bushels drilled, four to five when broadcast. Thick sowing is understood to be more consistent with the

DIVISION IN OATS.



habits of the plant than thin. I set out plots sown in various ways, as shown on preceding page; and although the dibbled plants stood best the heavy showers, I obtained no advantage in the yield to compensate for the increased time taken up in the operation of dibbling. Mr. Smith, of Lois Weedon, has sown oats on his wheat plan. He says, "Twice I have grown oats in triple rows, and three-feet intervals; and I make a heavy demand on the faith of the reader, when I tell him that the produce of the first year was eight quarters and a half of fine Poland upstanding oats—upstanding from being earthed up—the weight of which was forty-six pounds to the bushel; and of the second year nearly the same." One advantage obtained by this method of culture is the facility given to stir the soil between the rows, and to keep the crop free from weeds. It was curious to note in the plots I sowed on this triple row and wide interval plan, how the sides of the rows nearest the intervals grew up straight and stiff, like green walls. The plots, indeed, throughout their whole extent, were as flat as the surface of a bowling-green, arising from the beautiful uniformity of height of all the rows, contrasting very markedly with the irregular height of oats often seen growing in furrows and sowed in the ordinary way.

RYE (botanical name, *Secale cereale*).—Although only best suited for light and sandy soils, and a grain not much used in domestic or farm operations, the reader may be desirous to have some of it growing on his little farm. The variety known as "Giant Rye" may be grown. When the ear of rye is newly sprouted, it is a beautiful plant. "When the bloom is on the rye," is a quotation doubtless familiar to many of my readers. The time of sowing winter rye, the variety most commonly cultivated, should be as early in the autumn as possible, four weeks before the wheat is put in. This is necessary, that the roots may have firm hold of the soil before frosts set in. The quantity of seed is three to four bushels per acre, broadcast. Rye may be sown in the autumn, to be cut for fodder purposes early in

the spring. It is valuable in this way, and by sowing a succession of plots, the second plot some three weeks or so after the first, a succession of cuttings may be obtained in early spring, when green food is scarce. When used in this way, it is a very common practice to sow vetches with the rye.

BEANS (botanical name, *Faba vulgaris*) (see Fig. 21). —Wheat lands are the best for beans. Beans are often sown broadcast; but this is a slovenly and wasteful way. One object attained by sowing beans in drills twelve or fifteen inches apart is getting the land cleaned and freed from weeds during the growth of the plants. One of the advantages of the bean crop treated in this way is, that it is a cleaning crop, and well suited to precede the wheat crop. The sowing of beans whether thickly or thinly is a much disputed point; for winter beans, one and a half to two bushels per acre, and for spring, two to four bushels, are the usual quantities. The result of different ways of sowing ordinary horse beans which I adopted last season was, that having the rows far apart but thickly sown in the rows, gave the greatest produce. When the lines were three feet apart, thus, and very

Fig. 21.

Three-feet interval.

Three-feet interval.

thickly sown, the plants came up strong and vigorous,

and were podded, or "corned," equally on both sides, from top to bottom. Where the rows were still three feet apart, but the beans dibbled in the row nine inches apart,

. . . .

Three-feet interval.

. . . .

Three-feet interval.

. . . .

the plants did not come up so strong or vigorous as above, nor was the produce so great; although, from each stool of plants being completely separated from its neighbour, the plants were podded from heel to head. In the rows set thus, each row nine inches apart, it was

curious to note how well podded the plants of the outside rows were compared with those of the interior; thus showing the necessity of plenty of light and air where a full yield of beans is required. Where in the nine-inch rows the beans were dibbled in at nine-inch spaces, thus, the produce was not so satisfactory as

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where the rows were seeded continuously, as on the preceding plan. Altogether, I am inclined to join with the author of a practical paper in a late number of the *Farmer's Magazine*, who states that if "you practise thin seeding, take care that you have plenty of seed in *each* row; but let the saving of seed be in having *the rows widely apart*. You thus secure regularity and

sufficiency of plants, while great space is provided for their full development."

The "topping" process is one which must not be neglected, however tedious it may appear. As soon as the "black fly" appears on the tops of the plants, let the top of each plant be carefully snipped off.

Where wide spaces are left between the rows of beans, it is usual to grow cabbages there. I have found that cabbages grown thus are not satisfactory in bulk; they go too much to "leg," are drawn up thin and lanky, and heart indifferently. Where the beans are taken early off, time may be allowed for the cabbages to develop themselves; but this will not generally be the case in "weeping" climates. It will be infinitely the better plan to keep the intervals unoccupied, well stirred, and free from weeds. On this point the writer in the *Farmer's Magazine* may again be quoted with service:—"The drilling of beans at very broad distances, and pursuing a system of tillage between, is not nearly so generally adopted as it might be, with very great success. We have seen winter beans in *single rows*, five feet apart, yielding fifty imperial bushels per acre, the manuring, of course, being very high, the tillage exceedingly deep, and the hoeing followed up with frequency."

The bean crop is one which requires high manuring, the preparation of the land being very similar to that required for turnips, which important crop of the farm I shall shortly treat of.

Manures are not usually applied *directly* to the grain crops, as they are made to follow root crops, as turnips, which are heavily manured. Potatoes being considered an exhausting root crop, manure is by some applied directly to the wheat crop which succeeds it. Artificial manures, as guano, nitrate of soda, &c., are now applied to the grain crops, being most frequently used in the form of top-dressings. When wheat is top-dressed with nitrate of soda, it should be applied in the early spring, and not later, if the weather will permit, than the beginning of February. It is not advisable to

apply this manure in the autumn, although Peruvian guano should be applied at this period, as it takes longer to show its effects. I had six plots under winter wheat cultivated in all respects precisely alike. In the spring I top-dressed two with nitrate of soda alone; two I top-dressed with a mixture of nitrate of soda and common salt; and two I left not top-dressed. It was some weeks before any marked difference showed itself between the plots top-dressed and those not so; but as soon as the spring weather began to set in the difference began to show itself, and it was not long before it was very marked. The colour of the top-dressed plots began to change to a beautifully deep and healthy green; and this was maintained during specially trying weather, when cold, dry, cutting east winds prevailed, which seemed to shrink down and make yellow and sickly-looking the plants of the plot not top-dressed. Throughout the whole season it was apparent to the most casual observer that there was a marked difference in the mere colour of the plots, this being all in favour of those top-dressed. Nor was the difference in the vigour of the plants less observable; the plots being all in close contiguity, it was gratifying to note that the top-dressed plants towered inches above their neighbours less fortunate in this respect; and, with thicker stems and broader leaves, showed also how much they owed to the care which had given them the means of such a higher development. But it was when the plants came into ear, and as these advanced to maturity, that the difference in favour of the top-dressed plants was so marked and gratifying. The produce of the plots not top-dressed was fully one-third less than that of those top-dressed. I here speak of the top-dressed plots as if they had been top-dressed alike, but it was not so; two were top-dressed with nitrate of soda alone, two with a mixture of the nitrate and common salt. The mixture, of course, was much the cheaper of the two manures, yet no difference could be perceived in its effects as compared with the nitrate of soda alone; if any difference existed, it was rather in favour of the mixture.

Nitrate of soda is specially valuable as a top-dressing for oats. I applied a mixture of it—coal-ashes and the nitrate in equal proportions—to a plot of oats; the effect, as compared with a plot not top-dressed, was very satisfactory. The effect, however, was more marked in the increase of straw rather than in that of the grain; but in its strength and thickness rather than its length. As a neighbour remarked of them, "they come up like trees."

In carrying out various experiments with manures, I can promise the amateur farmer an endless source of amusement and delight; and if carefully done, he may arrive at results of which even practical farmers may acknowledge the value.

HARVESTING.—*Wheat* should be cut, either with the scythe or with the sickle, eight or ten days before it is dead ripe; a better sample is thus obtained, and the yield of flour increased. Red wheat should stand a little longer than white. If the grain, on being pressed between the finger and thumb, yields moisture, it is not ready for cutting. *Barley* should be cut as soon as the ear begins to drop. *Oats* should never be allowed to stand till they are fully ripe, as a large proportion of the seed is shed; they should be cut while rather greenish in the straw.

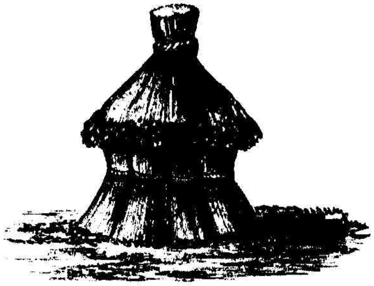

Fig. 22.

In this weeping climate of ours it is of the greatest importance to have good methods of "stooking" the corn when cut, so that it can stand without much injury in rainy weather. Last year I adopted the system of putting the sheaves as in Fig. 22. Fig. 23 shows the method practised by Continental farmers, and known to them under the name "moyette." In putting up the

grain in this way, a workman holds a small sheaf on end, compressing it at the top; other workmen bring other sheaves, and arrange them so that a cone as perfect in outline as possible is formed. This is bound together, at a distance of one-third of its height from the top, with a straw rope to render it steady on the ground in windy weather. The whole is then capped by an inverted sheaf, the straws being spread out as smoothly as possible. I found that in stooking in this manner the results were more satisfactory when the capping sheaf was made larger than the standing sheaves. When all were made of the same size I found it a difficult matter for the ends of the inverted sheaf to cover properly all the standing corn beneath. In setting up stooks after this fashion, the great point is to make as perfect a cone of the standing sheaves as possible — head compressed, and swelling and secure base. Great care also should be taken to place the capping-sheaf right in the centre. A little practice is required to gain the proper degree of dexterity necessary to insure success in spreading out the ends, and "solching" down the cap thus spread out on the heads of the standing sheaves.

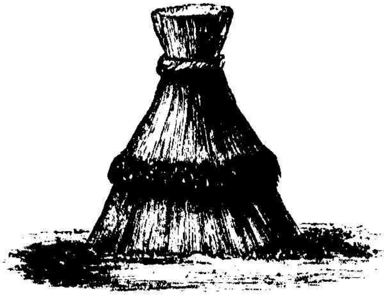

Fig. 23.

The great objection to this method is, that the whole is so closely put together that no air can get through the mass. To get rid of this, I modified the plan this season by placing eight sheaves together, four on each side, the heads close together, the feet spreading out; the two rows forming, as it were, a steep roof. The eight sheaves were then "capped" or hooded by two sheaves reversed. This plan admits plenty of air to pass through.

CHAPTER XIV.

ROOT OR GREEN CROPS.

THE most important of all the crops for winter consumption of dairy or fattening stock is the swede, of which Fig. 24 is an illustration.

Brassica campestra.—This is a species of cabbage, not a true turnip, in the ordinary acceptation of the term. Its place in the rotation is after a white or grain crop, as wheat. The preparation of the land is of the greatest importance as regards the future prospects of the root. The best soil is a loamy; but the root may be grown in a wide variety of soils, so that care is taken to have the land well pulverised and worked. To do this, there is no better implement on a small scale than the spade or fork; these are the mainstays of the amateur farmer in the preparation of his land. As soon as the crop which precedes the root crop is off the land in autumn, it is advisable to turn up the soil; and it is the opinion of some that this is the proper time to dig in the manure. Whether this latter point is correct (and it is certainly open to discussion) matters not here; but there can be but one opinion of the advantage of having the land turned up and exposed to the improving influences of the frost and atmosphere during the winter.

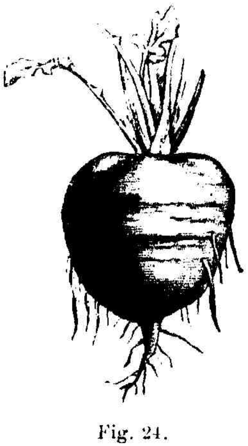

Fig. 24.

In spring, as soon as the weather permits, let a second digging be gone through preparatory to throwing up the land in ridges. When this is done, the manure is at the same time placed beneath the crown of the ridges. The distance between the ridges varies from eighteen to twenty-six inches. Other things being equal, it will be found more beneficial to have the distance between the rows a greater rather than a less distance mentioned above. Plenty of air and light to the roots will not be thrown away. The quantity of manure—farm-yard manure—to the acre given to the swede crop is from fifteen to thirty tons, according to circumstances. Although turnips are usually highly manured, it is questionable how far the diseases which attack the roots are not aggravated, if in some cases they are not caused, by over-manuring. The preparation of the land should all be finished in time for the sowing of the seed, which usually extends from the middle of May to that of June. The quantity of seed sown per acre is usually from two to five pounds per acre; but thin sowing, in the case of the root crops, is not at all desirable. As one of the scourges of the turnip crop, "the fly," is apt to be greatly aided in its ravages by thin sowing, the great object in the turnip crop is to force on a rapid growth, so that the leaves will get beyond that stage at which they are attacked by the fly. As soon as they are in rough leaf, the plants may be considered safe from the fly.

The seed may be sown in continuous rows in a rut made in the top of the drill; or it may be dibbled in at intervals of nine to twelve inches. In cases where the seed is sown, and the plants come up in a continuous line, it is necessary to thin them out after they have grown to a height of two inches, or thereabouts, or even less, according to the vigour and strength of their growth. This may be done by the hoe, leaving "bunches" at intervals, which again are thinned by hand. When the seed is dibbled, the plants come up in "bunches," of course, so that no hoe is used. In thinning finally by hand the bunches left in either case,

a plant stronger and better developed than any of the others will almost invariably be found. This, designated by some as the "king plant," is the solitary one which should be left in, all the others being put aside. In dibbling, seed is saved to a large extent, and the hoeing is also dispensed with. In thinning out the plants, the distance between each is usually ten to twelve inches. In place of thinning the plants out to the full distance at first, they may be thinned out to only half the distance, and a few weeks' growth given to them; then thin out the *weakest* plants, giving the full distance between for the strongest plants to develop themselves. The thinnings are greatly relished by the pigs and cattle. It is, I need scarcely say, of the greatest importance to thin out the plants perfectly. Where two or three are left together none of them do well, but monstrosities of growth only result as in the annexed figure (Fig. 25), which represents two mangolds, one of which was neglected to be taken out. Monstrosities in the turnips are just as common from this cause; only in my crop this year I had none, while I had amongst the mangolds, of one of which the engraving is a representation.

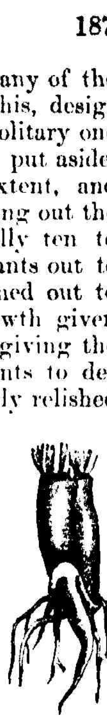

Fig. 25.

It is a popular notion that swedes cannot be transplanted; this is a mistake. I have known transplanting followed out with marked advantages in filling up blanks by transplanting plants obtained from a neighbouring farm. I knew a gentleman—who farms in a small amateur way—convinced, in a very striking manner, of the fallacy of the notion above alluded to, which he maintained to be correct. A party had some blanks to fill up, both in his swedes and mangolds, who happened to be visiting this gentleman at his house, distant upwards of two hundred miles from his own place, when he was thinning out his swedes and mangolds, and seeing they were fine plants, he determined on taking a lot home. This determination he carried

out, to the silent surprise of his friend, who looked upon the affair as a nonsensical scheme. The plants, taken up one afternoon, travelled all next day, and were transplanted the following evening, which, fortunately, was a favourable one for the purpose. They not only did well, but proved to be about the finest roots at the end of the season. The mangolds especially were very fine. It might be advisable, then, to have a small seed-bed of plants for filling up blanks.

The varieties of turnips grown are very numerous. The following (Fig. 26) is a drawing of a White Globe

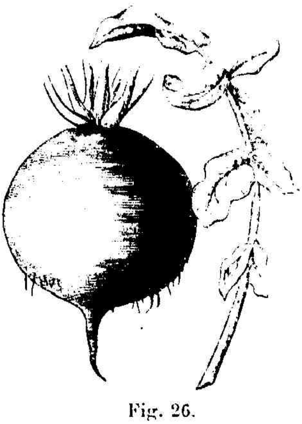

Fig. 26.

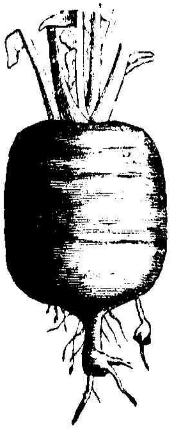

Fig. 27.

Turnip, Fig. 27 of a White Tankard, and Fig. 28 of a Yellow Turnip, in shape, &c., between the Globe and the Tankard. Turnips are liable to diseases, as the "fly," the "finger-and-toe," and "anbury." The remedies proposed for these diseases are very numerous. For the fly the following top-dressing has been recommended: 14 lbs. of sulphur, 1 bushel of fresh lime, and 2 bushels of road scrapings. These quantities are for an acre, and when well mixed should be applied at night. As the fly only attacks the turnips in the

early stages of the plant, some have sown common mustard between the drills at the same time as the turnips are sown; and as the mustard comes up the first, the fly attacks it, and gives the turnips an opportunity to get into the "rough leaf," at which stage they are free from liability to be attacked by the fly. The mustard, if not eaten by the fly, need not be lost. I allowed some of mine to grow to the height of a few inches, pulled it up, cut off the roots, and gave the tops to one of my cows, which had a particular fondness for it. Pigs will also eat it.

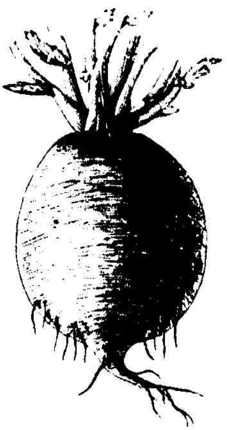

Fig. 28.

A very great deal has been written on the subject of "finger-and-toe," which distorts the bulbs (see Figs. 29, 30, and 31), and "anbury," which dis-

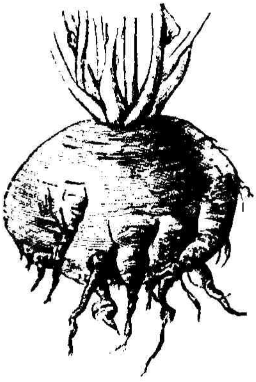

Fig. 29.

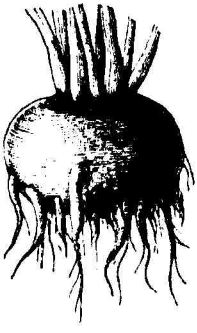

Fig. 30.

figures the surface of the bulbs with wart-like excrescences (see Fig. 32); and a number of remedies, as well as

methods of cultivation likely to prevent these diseases, have been proposed. The popular remedy is the application of lime. In view of the extraordinary development which the diseases ravaging the turnip crop have taken of late years, it is worthy of consideration how far the system of over-forcing the growth of the bulbs by an excess of stimulating manures has not brought about in process of time a weakness in the plants, thus giving them a liability to disease. We are now becoming alive to the evils of over-feeding our cattle; and, reasoning from analogy, may we not expect the same evils to arise from the persistent, long-continued over-manuring of our bulbous crops? Moreover, is not the

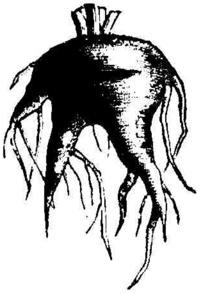

Fig. 31.

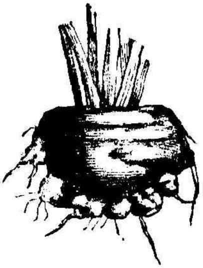

Fig. 32.

practice of taking the crops too often from the same land a faulty one? In the chapter on Rotations, I have spoken of the necessity which apparently exists for change. Change, indeed, is one of the great laws of nature; and it is worth while drawing lessons from her to aid us in our operations.

The manures used for the turnip crop, in addition to the great staple—the farm-yard manure—are Peruvian guano, and superphosphate of lime. The guano should be broadcasted over the farm-yard manure after it is spread; and in forming the drills, the manure and guano get covered with soil. When guano alone is used for turnips, as it sometimes is, it is sown upon the

land previous to forming the drills. Superphosphate, or dissolved bones, may be used in the same way. Mr. Spooner recommends, as a manure for the turnip crop the following:—Half cwt. of guano, ditto of superphosphate, 1 cwt. of bone-dust; the mixture resulting being sufficient for an acre. I have found the following give as good results as farm-yard manure:—Peruvian guano and coal-ashes, mixed in equal proportions; also nitrate of soda and coal-ashes in equal proportions.

As the amateur will likely cultivate a variety of turnips, and try a number of experiments, and as, consequently, he will have comparatively small plots under culture, in place of using the artificial manures as above described, I would recommend him to spread by hand, or rather run out a narrow track of manure on the land in the direction of the ridges, and at the distance he wishes; then covering these tracks up with soil, the ridges are formed; and on the apex of these the lines or ruts are made with the hoe, the seed dropped in, and the whole covered in with the rake. Plots also may be sown on the flat. If artificial manure is used, this may be sown over the land before it is dug; or a series of deep ruts or furrows may be run with the hoe across the beds, a layer of manure laid in this, above the manure soil; above this the seed, which is finally covered by soil with the rake. The seed, be it noted, must *not* be placed immediately upon the manure, or it will very likely fail to germinate; soil must invariably separate the two. It brings the root on amazingly fast. The seed, immediately on germinating, certainly has all the advantage of being placed as favourably with reference to the manure as possible. I sowed one plot on this principle three weeks after the others, and on taking up there was a remarkable equality of produce. The rapidity with which the later-sown ones grew was very marked, nor was the soundness of the bulbs obtained at all affected.

The "home-made guano," as I call it, made of night-soil and dried earth, as hereafter described in the

chapter on Manures, I have found an excellent manure for turnips. I consider it quite equal, if not superior, in its effects to farm-yard manure.

MANGOLD-WURZEL (botanical name, *Beta vulgaris*).—This is now an important root. There are two varieties of it chiefly grown, the long (see Fig. 33) and the globe or oblong (see Figs. 34 and 35), the red and the yellow. The mangold is very subject to abnormal growth, or what is called "finger-and-toe" (see Fig. 25, *ante*, and Figs. 36 and 37 here given). The time for sowing is the end of April or beginning

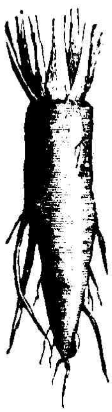

Fig. 33.

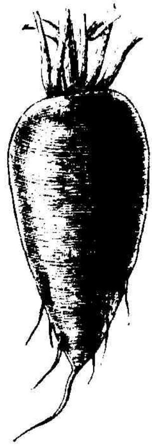

Fig. 34.

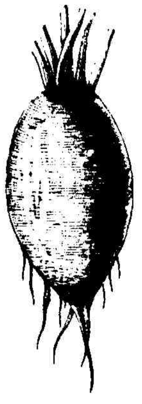

Fig. 35.

of May. The third week of April is considered the best time. The quantity of seed used per acre is 7 lbs. It is advisable to steep the seed in water for several hours, to soften it and assist its germination. I tried the difference in very dry weather, and which had continued for some weeks. The seed which was put in dry and hard scarcely came up at all; a plant here and there only. The seed which I kept moist till germination began to show itself, all came up without a single failure. In putting in the seed, the earth, after

covering it up, should be pressed firmly down. The mode of cultivation is very similar to that of turnips, already described. The seed is dibbled in at distances of twelve inches, from one inch to an inch and a half deep. I prefer, on the small scale, to dibble in at nine inches' distance, allow the plants a certain growth, then lift each alternate plant for feeding the pigs or giving to the cows; thus giving ultimately each plant a space of eighteen inches to grow in. Salt should form an essential ingredient in the manure for mangold-wurzel. After the plants are finally thinned out,

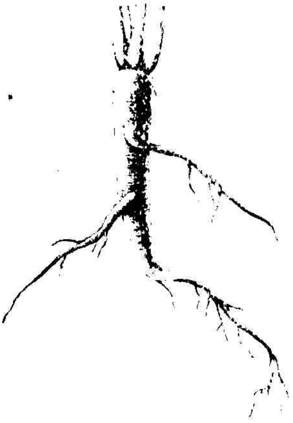

Fig. 36.

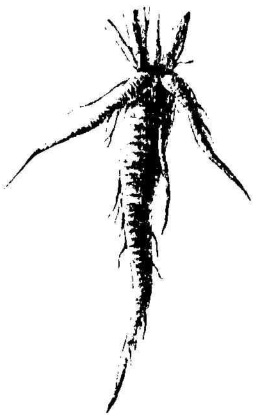

Fig. 37.

I have top-dressed them with a manure composed of coal-ashes, salt, and Peruvian guano, in the proportion of two parts coal-ashes, one salt, and one of guano. This was well mixed, and the man, taking a basketful, walked in the centre of the drills, and threw a handful at the foot of each plant. This was done during a drizzling "Scotch mist." This takes a little more time than throwing the manure at random would take, but it saves manure of more value than the time; and, moreover, it applies it where it is really required. I have also applied this manure to the kohl-rabi and cab-

bages; and on comparing the drills of those dressed with it and those not, a glance was sufficient to tell the difference in development of the roots.

I would recommend the reader to try the method introduced by M. Kœchlin for increasing the yield of beet and mangold, of which the following description, taken from the *Mark Lane Express*, is worthy of careful perusal:—

"The Kœchlin method is not, properly speaking, an invention, but the application to the beet-root of processes employed long since with other vegetables.

"In 1830, M. Kœchlin, who cultivates weeded plants (*sarclées**), asked why, of all those which we commonly transplant, the beet-root was the only one that was not raised upon a seed-bed? Whilst the cabbage, celery, lettuce, and a thousand other horticultural or semi-horticultural plants, sown under glass at the end of winter, may be transplanted in the first fine days, and have the whole season to develop themselves, the beet-root alone, raised in the open field, and sown after the disappearance of the frosts, is only ready to be planted out by the middle, and often towards the end of June, at the moment when the heat and drought render the drawing, transplanting, and revival of the plant much more difficult, and when the part of the season most favourable to vegetation has already passed. Seeing no plausible reason for this exception, M. Kœchlin made an experiment. He sowed some seed on a seed-bed towards the end of January, covered it with a frame, and planted them out in March. The result of this attempt surpassed his hopes; he obtained a crop double that obtained from the common method. From that moment he adopted the process into his practice, and has uniformly had reason to congratulate himself upon it. . . .

"At the commencement, M. Kœchlin sowed at the end of January on a hotbed, and transplanted towards the middle of March. In order to economise the sur-

* This is a French term for root and other plants requiring repeated hoeing.

face of the beds and the number of frames employed, and perhaps also to show the excellence of their method in producing enormous roots, they planted the seedlings at 60 centimètres' (about 22 inches) distance each way, so that they required per hectare only 26,000 or 27,000 plants (about 10,800 per acre), which they obtained from a bed of from 22 to 27 square yards. This system presented many inconveniences. It required the employment of a large quantity of dung, produced plants too watery, and consequently too delicate, and yielded many hollow beet-roots—that plant being liable to this defect when it attains an enormous size.

"After ten or twelve years' experience, M. Irvan Kœchlin determined therefore to modify his process in the following manner:—Towards the middle of February he placed, either in the garden or in the fields, but always in a warm and sheltered spot—if possible by a wall—frames thirty-nine inches wide, made of four boards of pine-wood. As to their length, it varies according to the number of plants wanted. The frames being fixed, M. Kœchlin dug and carefully pulverised the earth within it, and watered it plentifully with liquid manure. He surrounded the frames with hot horse-dung, and then, tracing with a garden-line small furrows very close to each other, sowed in them the grains one by one, and covered them over with a rake. At intervals he nailed across the frames laths to support mats, which economically supplied the place of glass sashes, and protected very effectually the plants from frost.

"In the first days of April, the plants generally reached the size of the little finger, or at least that of a good-sized quill, and were quite ready to transplant, which may be done even in spite of a drought, for having attained that size they always strike. In this manner he obtained plants much more hardy, only they required more space than by the old method, since they became larger. In other respects, this consideration is of little importance, the expense of the frames being insignificant. We should add, that the less

thickly the seed is sown on the beds, the better it will be; for the roots, remaining about two weeks longer in the fields than by the ordinary mode, are liable to run to seed, and nothing predisposes them more to this than too thick sowing. For the same reason, we advise cultivators never to use seed less than two or three years old.

"M. Kœchlin prepares his land in the same manner as English farmers are accustomed to do for sowing their turnips and ruta-bagas. After having got the soil into a perfect state by tillage, harrowing, and rolling, he forms, with the plough, ridges from eighteen to twenty-two inches wide, according to the richness and the nature of the soil, and spreads his dung in the trench; he then covers the manure by splitting the ridges, and finishes by levelling the tops with the roller. The land being thus prepared, he transplants the beet-root upon the crest of the ridges, placing them at thirty to forty centimètres, or from twelve to fifteen inches, distant from each other. For this purpose, he uses a dibble with four wooden points, in order to accelerate the work.

"On this plan, it will be seen that it requires from 40,000 to 60,000 plants to furnish a hectare (or from 16,000 to 24,000 per acre). The beet-roots thus obtained are less in size, but more regular, and in the aggregate yield a greater product. When the plants have struck, they pass between the rows with the horse-hoe, after which they give them two or three weedings, according to the nature of the soil. After the last weeding, they lightly earth-up the plants.

"M. Kœchlin considers it very important not to dress the plants by cutting the ends of the leaves before transplanting. According to him, it occasions a loss of time to the plant, which receives much nourishment by the leaves. Left untouched, on the contrary, they increase rapidly, soon cover the ground, hinder the production, and, above all, the development, of injurious plants, and retain in the soil a freshness which contributes greatly to the growth of the roots."

KOHL-RABI (botanical name, *Brassica caulorapae*).—This plant, which goes by the name popularly of the

Fig. 38.

"turnip-rooted cabbage" (of which there are two varieties, the "globe" in Fig 38, and the "long" or "oblong," in Fig. 39), has for some time had the attention of farmers directed to it as an admirable substitute for the swede, which we see so frequently diseased. The kohl-rabi is easily transplanted, stands drought and frost well, and is not liable to be attacked by disease. The preparation of the land for it is very similar to that required for the turnip; it is greedy of manure. It is cultivated in two ways:

Fig. 39.

first, the seed is sown in seed-beds early in March; the plants are then thinned out, and allowed to grow some

five or six inches high, with a somewhat thick stem; they are then transplanted in the first week of May, the distance between the drills or ridges to which they are transplanted being twenty-seven inches, and the distance between the plants fifteen to eighteen inches. The second way is to sow the seed in drill in the month of May, and thin them out turnip-fashion. In the first mode, the quantity of seed required to raise a sufficiency of plants for an acre is eight ounces, a space of six yards square being required for this quantity of seed. For sowing in drill, four pounds of seed are required. As seed is very dear, this difference in the quantity required in both methods is worthy of consideration. But apart from this, from what I have learned in conversing with parties who have grown the plant, from what I have read of it, and from what I have seen in the two seasons I have grown it, I am clearly of opinion that the method of sowing in seed-beds and transplanting is the best. Looking at the roots I have had growing this year on the two systems, there can be no doubt, under my circumstances of soil, climate, &c., that transplanting gives the best produce. I say under *my* circumstances of soil, climate, &c., for I am not unaware of this, that many of the discrepancies and contradictory evidences which we hear and read of in connection with farming facts arise from the difference in these same circumstances of soil and locality. Hence the necessity of ascertaining by direct experiment which is the best out of a number of methods recommended. The farmer may have many excuses why he cannot undertake making these direct experiments, but the amateur farmer should have none; he ought to be the first to try them, and in thus adding to the stock of his knowledge, and perhaps to that of others, he will be greatly adding to the pleasures of his play-farm.

Fig. 40.

The PARSNIP, Fig. 40, is an excellent root for culture. Pigs are especially fond of it, as are also cows. Its texture even closely resembles that of the mangold or

the carrot, which is a crop which should be more valued than it is. Horses are fond of and thrive upon it.

CABBAGE (botanical name, *Brassica oleracea*).—The best variety is the Drum-head or Cow Cabbage, of which Fig. 41 is an illustration. The Swedenborgian cabbage grows high and tree-like; it produces a large amount of succulent fodder. I have grown some excellent specimens of it. Cabbages form a highly nutritious food for cows, and are calculated to promote the secretion of milk. The variety to be cultivated is the Drum-

Fig. 41.

Fig. 42.

head, or Cow Cabbage, as it is commonly called. The Tree Cabbage, too seldom cultivated, rich as it is, is a succulent produce for live stock, illustrated in Fig. 42. The seed should be sown in seed-beds early in March, on a piece of land well pulverised and manured. The land should be meanwhile prepared, and an ample supply of manure given to it, for the cabbage loves a rich soil. Salt should be added to it. Remembering the *marine* origin of the cabbage, we see why it is so much benefited by an application of salt. In transplanting cabbages, the lines should be 30 inches apart, and the cabbages dibbled in at the like distance in the lines. However, I do with this as with the turnips and

mangolds: I give at first a closer growth, and then thin out for feeding the pigs or giving to the cows. If a spare plot of ground can be prepared in autumn, cabbage-plants may be planted out in October if sown in seed-beds in August. Many will probably be killed by the frost, but those which survive will give early cabbages for spring feed. Unprecedentedly severe as was the frost of one winter, the cabbages which I planted out early in the previous October stood remarkably well, and I had in the spring numbers of well-developed cabbages, when others were but newly planted. In setting out cabbages for winter growth, it is a good plan to hoe up the earth on each side of the plants, thus making a species of embankment, which has a good effect in sheltering the plants from biting blasts. To give as much vigour to the plants as possible before winter sets in, I top-dressed them with a mixture of salt, ashes, and nitrate of soda. The same I applied to the rape plants. This plant, RAPE (botanical name, *Brassica napus*), is worth cultivating as an auxiliary for spring feeding. The seed is sown in seed-beds, from the end of June to the beginning of July; the plants transplanted at the end of September or beginning of October, at distances of 12 to 15 inches in the rows; the rows the same distance apart. The plants will be ready to cut down early in spring, and may be used as cattle-food. VETCHES (botanical name, *Vicia sativa*) are also sown in the autumn, to be cut down in spring as green food.

POTATOES.—About the cultivation of this crop—one of the most important of the farm—little need be said, as every one is familiar with it. Much has been written about the disease to which the crop is so unfortunately subjected, but with little practical result; we are as far off as ever from a successful solution of the mysterious question, What is the cause of the potato disease? I have tried three or four ways of culture, each of which has been recommended as a remedy, but the same result has been obtained as before. Some have argued—and argued, I need scarcely say, plausibly—that the system of cutting "sets" is a bad one; and that we should grow the crops from whole potatoes,

To put the matter to the test in a small way, I set out in the same ground, and under precisely the same treatment as to preparation of the land and manure applied, three plots: one was set with whole potatoes; the second with "sets," each potato being divided into *two* parts; the third plot with sets, each potato being divided into *four* parts. On being taken up and measured, the results were as follows:—Setting down the produce of whole potatoes as $1\frac{1}{2}$, the produce of the plot of halved sets was $1\frac{1}{3}$, the plot with quartered sets $1\frac{1}{4}$. In the amount of produce, there was thus remarkably little difference, but the potatoes grown from the whole potatoes were remarkably sound, and contrasted, in the matter of disease, favourably with the quartered plot. The *Jerusalem artichoke*, which is a tuber crop like the potato, is well worthy of cultivation on the small farm, as all live stock are fond of it. It has one great advantage, that it will grow upon land so poor as to be useless for any other crop. It is more, even a beautiful plant, in the habit of generally sending up long stalks with graceful foliage (see Fig. 43).

Fig. 43.

In taking up the roots, turnips, mangolds, &c., I should advise "time to be taken by the forelock;" that is, to do so rather early in October than later. A night's severe frost, such as we occasionally experience, and which results in the loss to the farmers of England of many thousands of pounds, may do away with the labour and blast the hopes of weeks. The risk run by keeping roots too late in the ground is not overbalanced by the small growth which may be obtained by letting them remain in the ground till an advanced period. Besides, time will be gained by getting the turnip land ready

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for the early sowing of the wheat. The kohl-rabi, standing frost well, may be left later out; indeed, in many cases, it has been allowed to remain out till spring, with comparatively little loss. The following is a scheme for setting out the division in root or green crops:—

DIVISION IN ROOT GREEN CROPS.

No. 1 in General Plan.

Butt No. 1 .	Swedes and Mangolds in alternate rows.
Butt No. 2 .	Mangolds—Leaves to be stripped off for feeding.
Butt No. 3 .	Mangolds—Leaves to be left on till taken up.
Butts Nos. 4, 5, 6, 7 . .	Swedes under different manures.
Butt No. 8 .	Green Kohl-rabi, transplanted.
Butt No. 9 .	Purple Kohl-rabi, transplanted.
Butt No. 10 .	Green Kohl-rabi, sown in drill, and thinned out.
Butt No. 11 .	Purple Kohl-rabi, ditto, ditto.

My house accommodation being anything but limited, I store under roof all my roots. Where this house accommodation is not attainable, "clamping" or pitting must be resorted to.

CHAPTER XV.

HAYMAKING.—MANAGEMENT OF MEADOW LAND.

I have now to conclude the present division of my little book with a few remarks on this important subject. I can give but little space to it, as little space is now left me; but for fuller information I refer to the works of which a list is given at the end of the preface.

Preparation of the Meadow for the Crop.—The first essential to be attended to is the manuring of the land, the kind of manure to be used, and when to apply it. The manure almost universally used is farm-yard manure. To enable this to act upon the land in early spring—the time when its action is required to push on the grass to maturity—it is necessary to have the manure applied as early in autumn or winter as it can be conveniently done.

Of artificial manures for hay crops, Peruvian guano and nitrate of soda are now principally used. I have used the latter chiefly; its effects are striking and satisfactory. Not only is the growth quicker and the produce larger, but the quality of the herbage is wonderfully improved. In one field I have had a striking evidence of this: the weeds with which one part of it was infested have disappeared, or are disappearing fast. As a general rule—that is, unless where I have been trying special experiments—I invariably mix the nitrate of soda, and the Peruvian guano also, with an equal weight of coal-ashes, finely sifted. I have tried portions under the two—nitrate of soda alone, and nitrate of soda and coal-ashes—and have found the plots under the latter yield as good results as those under the former. Dr. Voelcker, chemist to the Royal Agricul-

tural Society, first drew my attention to the importance of mixing artificial manures, especially guano, with dried earth or ashes. I believe a large waste of such valuable substances as nitrate of soda is made every year by using them in their crude condition, and using them alone. They should invariably be well pulverised; and I am convinced that it will also be a saving if they are mixed in greater or less proportions with ashes.

I have also used as a manure the "home-made guano," or deodorized night-soil, described in the next chapter as a top-dressing for meadows. All artificial manures should be applied as early in the spring as the weather will permit.

HAYMAKING.—The haymaking season, according to popular notions, is the most joyous of all on a farm. Poets have sung of it, and townsmen dream of its delights; but only those who have worked at it know how hard is the work connected with it. It is all very easy to lean lazily over a fence, and look at the mowers, "cutting their *sounding* way," as the poet of the "Seasons" has it; but an hour's toil—if, indeed, the work by amateurs' hands could be done at all—would soon dispel the romance of the thing, and convince one how very hard the mower's work is. The same with all the other departments of haymaking. The young ladies of the family may go out on a fine breezy afternoon, and with streaming ribbons and flaunting lace may hand for a short time, and hand it gracefully too, as no doubt they will, the hand-rake or the "pikel," and think the while how nice it is; but when "cross-cutting" is indulged in, or "windrowing," for the best part of the day, some idea will be formed that haymaking is really downright hard work; and if this brings with it, on the part of the "lady haymakers," consideration for those who work continuously in the field, the lesson will not be without its value.

As soon as the haymaking season approaches, let all the tools be looked up and put in order, rakes mended,

and scythes sharpened. And on deciding where to "cut," or rather when, let the workers be engaged, and take care that there are plenty of them. It is the most mistaken economy possible to stint the number of the workers in the hay-field. At no other time should the old maxim, "Make hay while the sun shines," be borne so continually in mind as in haymaking time. The delay or loss of a day may imperil your whole crop.

There are many important points connected with the hay crop, some of which receive at the hands of farmers hot discussion; all these I have not space to enter upon, but a few of them may be here adverted to with profit. And first, as to the best time to cut the grasses. This is generally when they are in flower. Italian rye-grass should be cut down as soon as the flowers show themselves, as this is the period when the grasses are the most nutritious. Moreover, as this crop is such a rapid grower, with good management, two, three, and even four crops may be obtained in the season. Peruvian rye-grass may be allowed to come into flower, and clover into full blossom. Meadows being usually composed of a variety of grasses, it is necessary to become acquainted with the various appearances and times of flowering of the varieties grown; you will in this way find a period at which a greater number will flower than at any other period: cut at this period if the weather be favourable. You will find, in my little work entitled "Hints for Farmers" (Routledge), at page 57, a table showing the periods of flowering of the different grasses, which may be of use.

In making hay, the general rule is to "get" it as rapidly as possible, consistent with the due dryness necessary. With good management, and with good weather, the hay from mixed meadows may be got in in three days; that is, suppose you begin to cut early, very early, on Wednesday morning, you may get it housed by the Saturday evening. I know of no method so good to ascertain when hay is ready as by taking a handful and plunging the face into it. The peculiar

feeling—showing absence of positive dampness, yet the presence of that degree of moisture so essential to good hay—imparted to the skin, as well as the smell, will tell whether the hay is ready or not. Of course, one in this case must have a little experience to fall back upon. As soon as it is ready, get it off the field with all possible despatch. Lose not a moment, nor be influenced to allow it to remain another day by the representations of men who are sometimes—I say it with all charity—thinking more of getting another day's work out of it than of getting it well housed. When hay is ready, the place for it is the stack or the hay-barn, not the field.

The methods of managing the work of the hay-field vary in different districts. The following short extract from Arthur Young's "Farmer's Calendar"* will give a fair notion of the mode of making hay applicable to the majority of districts:—

"In executing the work, observe particularly that the labourers cut as close to the ground as possible; grass never thrives well that is not cut quite close, *and the loss in the crop of hay is very considerable*, for one inch at bottom weighs more than several at top. In making it into hay, you will be a loser if you have not many hands ready for the work. It should be shaken out directly after the scythe, windrowed (that is, raked into rows) before the evening, shaken out again next morning, and in the afternoon got into grass-cocks; these should be opened the morning following, and got into the great cock by night, by which time the hay will be well made if no rain comes; but in case of bad weather, the process will be more tedious. If successive rains come, so that the hay is damaged, and you are fearful of its turning out unprofitably, by all means salt as you stack it; a peck, strewed

* I take this opportunity to draw the attention of the reader to the new edition of this work, published by Routledge. It is edited by the well-known agricultural writer, Mr. John Chalmers Morton, and is enriched by all the stores of information and the results of experience which this gentleman has at his command.

in on the stack, to one load of hay will have a very marked effect in sweetening it, however bad it may be, even if it be black ; and it has been found by experiment that horses and horned cattle will eat damaged hay salted, which they would not touch without that addition."

The following are schemes for laying out meadows under different manurial treatment :—

LONG MEADOW.

Division No. 1. Farm-yard Manure. Date when applied, and quantity.
Division No. 2. Home-made Guano. Date when applied, and quantity.
Division No. 3. Artificial Manure, composed of nitrate of soda, common salt, and wood-ashes, in equal parts. Date when applied, and quantity.
Division No. 4. Liquid Manure, from cow-house tank. Date when applied, and quantity.

CHAPTER XVI.

MANURES.

It will be necessary to say a few words on this important subject. Manures are divided into two great classes, farm-yard, and artificial or special.* Farm-yard manure is, as my readers are aware, composed mainly of the droppings of the farm stock mixed with the straw or litter which is used for their bedding. This straw forms, therefore, an important part of farm-yard manure. I have had occasion to refer rather frequently to the disputed or vexed questions in agriculture; and when I say that the mode of treatment of our farm-yard manure is another of these vexed questions, the reader will begin to think that agriculture must be in a very unsettled state, since everything connected with it is liable to be disputed. And it really is the case that the diversities of farm practice is one of the most remarkable things connected with the art: nor need this be wondered at, when we think of the wide variety of soils and climates with which the farmer has to do, and the ever-varying peculiarities of the plants he has to raise, or the stock he has to rear and to maintain. But to return: I have said that the best mode of treating our farm-yard manure is anything but decided A great deal has been written, and infinitely more has been said, on the importance of keeping dung covered, so as to prevent its being washed by the rains or its ammonia evaporating into the air. Doubtless the weight of evidence is in favour of the covered dung-pit or

* Strictly speaking, there is an important distinction between artificial and special. An artificial manure may not be a special one.

stand, and numbers of practical farmers are beginning to hold this opinion; yet, nevertheless, it is worthy of note that but a short time ago a conclave of the best farmers of the day decided against the covered dung-pit. Again, the question of which is best to apply to the crop, long or fresh dung, or short or rotten dung, is fiercely discussed, and is by no means in a fair way of being settled. A covered dung-pit is one which is walled in, and is provided with a roof, but with the sides open. The following is the mode of treating the dung in a pit of this kind, as described by an intelligent correspondent in the pages of the *Agricultural Gazette*:— "The droppings and soiled litter of stall-fed cattle, and the same from the work-horse stable, are daily thrown into a walled and covered pit, care being taken that they are intermixed. A dozen feeding-pigs are kept in the pit; any loose litter that may be found lying about, together with road-scrapings and odds and ends of animal and vegetable refuse, are thrown in; the pigs mix and incorporate the whole well together. From time to time, the liquid from the manure-tank is pumped in; and thus we have generally a deposit of a considerable quantity of well-made manure at hand to supplement the dung-heaps when they are exhausted."

A valuable adjunct to the manure department is the liquid manure-tank. One should always be appended to the cow-house, a drain leading from this to the tank. Although experience has shown that liquid manure is most beneficial in light, sandy soils—remarkable evidence of this is found in the sandy plains of Belgium—and is not so useful, if so at all, in heavy soils, still, on the great majority of amateur farms, a liquid manure-tank should invariably be constructed. It is worthy of note, that the urine from the cow-house, if left in its original condition in the tank, soon loses its ammonia; but if the urine is diluted with water, the ammonia is retained. This mixing should be made to the extent of half the bulk of the urine, and should be made immediately on collection. But as the supply is not made all at once, but from day to day, the water should be sup-

plied at intervals; the best way to do it is to wash down the gutters in the cow-house with water, and let the whole run into the tank. The diluted liquid manure is an excellent thing to water the drills of the mangold-wurzel in dry weather, after sowing the seed. As this seed is very hard, and takes some time to germinate, this watering is of great assistance.

The manure of an amateur farm should be supplemented from every conceivable quarter. "Waste not, want not," is, or ought to be, the motto in this department. I place great value upon coal-ashes. I have an apartment in my steading to which the ashes from the house and furnace fires are taken every morning. They are there carefully sieved—the cinders are famous for backing up a fire, or for burning in the furnace for cooking the food—and the ashes are carefully stored up. I know of nothing saved in a house possessing so wide a utility as the coal-ashes. All the varieties of turnips love ashes as a manure; and mixed with nitrate of soda or guano or salt, they make a good top-dressing for grain, root crops, or for grasses. Soot also is a valuable manure, and this I buy at a moderate rate, and store up carefully. Salt I use largely for cabbages, mangold-wurzels, and for grass lands; it forms a valuable part of the artificial manures I make for some of my experimental plots.

I set also great store by the house sewage, or rather, the contents of the privies. This is a highly valuable manure, and much of the unpleasantness connected with it can be obviated, and its value increased rather than diminished, by treating it after the method introduced by the Rev. Mr. Moule. This I consider one of the best methods of utilising what, unmixed, is in every way a nuisance; and having adopted it on a rather large scale, and with marked success, I can confidently recommend its adoption. The Rev. Mr. Moule describes the method of treatment in a pamphlet entitled "National Health and Wealth."*

* Bradbury and Evans, London.

A point worthy of notice in connection with this mode of treating *excreta* is the capacity of *repeated* action which the dried earth possesses. So marked is this, that separate masses of night-soil can be mixed with the earth after even short intervals, and each separate mass is, when mixed, thoroughly deodorized.

Professor Skilling, of Queen's College, Belfast, has introduced a new manure, which he calls a stimulating manure, used principally for the turnip crops; as this is capable of being made on every farm, and uses up all the house *débris* of whatever kind, I think it will serve some useful end if I give here the Professor's own description of it:—

"We have a pit by itself, independent of the general farm-yard pit, for its reception; this pit communicates with, and receives any excess liquid that may escape from, the large pit; also, with the scullery, kitchen, water-closets, &c., &c., receiving everything in the form of manure that is valuable and useful; into this also is poured, as well as the necessaries connected with it, all ashes from the fires, in many cases from consumption of materials, turf on farm, or in the bogs, all drippings of the houses and yards. It may be mentioned here that all kinds of ashes are perfectly grateful to the turnip.

"We sometimes add dry peat-mould as the best deodorizer; we use this in poultry-houses, pig-yards, &c., and when fully saturated, add to our heap; all green weeds from farm and garden, before seeding, are likewise added; and in fact, every vegetable and animal substance that will decompose in time, as the greater the number and variety of substances the better the manure. Occasionally, also, we purchase some town manure from private and cottar houses; this is an excellent addition; all this we collect up to the following spring, when decomposition has made great progress, and the heap is one dark rich mass. As soon as dry weather sets in during February or March, we have the pit cleared out, the contents spread in a yard with hard dry bottom, and if the weather be favourable, with

frequent turning, it will be dry enough and ready for riddling or screening in two days or so. This we have carefully done, returning the coarse riddlings to the general dung-heap, and carefully storing the fine stimulating manure in sheds or houses for the purpose, to keep it from wet, and allowing it to remain there until required for use."

Of special and artificial manures the amateur will be well supplied if he has Peruvian guano, nitrate of soda, and superphosphate; and in connection with these I have made some remarks at the conclusion of the chapter on the subject of Manures for Meadow-land.

CHAPTER XVII.

PRINCIPLES OF CATTLE FEEDING.

WHILE showing an intelligent man—one who wishes always to know the "reason why"—over the buildings of my little farm (I could scarcely dignify them with the title of *farm-steading*), I took him into the apartment then used as a store for the various foods for my stock. Of the bags and bins containing these, there was rather a formidable array: one bag held bran, another rice-meal, a third Indian-corn, a fourth beans, another oats, a sixth barley, while a large heap of oil-cake lay in a corner. This variety of materials seemed to puzzle my friend somewhat, who said to me that it looked very like making a great business of a simple matter; for old Brown—my friend's agricultural oracle—used nothing but turnips and straw, with a handful of hay now and then as an extra treat. "As for oil-cake," quoting here old Brown, "and all them new-fangled things he knowed nowt about 'em, nor cared nowt about 'em for the matter 'o that eyther." Merely remarking that the notions "o' owd Brown" were none of mine, or of the authorities to whom I pinned my agricultural faith, we passed through the "shippen" or "byre," in which my cows were quietly ruminating after their afternoon meal. The afternoon was fine, but very cold withal; notwithstanding which my friend wondered why the poor animals were not out in the field enjoying the air, instead of "sweating"—so he neatly expressed it—there in that "nasty, stinking place." Now, if there was one thing my man prided himself on, it was the nice, orderly, clean condition in which the shippen was kept; and so far as stench was concerned, I smelt none, the only odour

was the sweet healthy one which cows exhale; but I did not point out these facts, simply stating that in this cold weather I could not afford to let my cows out, it wouldn't pay. "I dare say," I continued, "that your friend old Brown would think I was doing anything but a paying thing; but if he is content to starve his cows, I see no reason why I should do the same with mine." Saying this we passed into the machine-room, where William was busy cutting hay and oat-straw, which formed part of a food, some of which, just newly prepared, sent forth a temptingly odorous smell, and the nature of which my friend was eager to know. Explaining to him briefly its composition, and the office which each ingredient was destined to perform in the animal economy, his look betrayed his disbelief in its supposed virtues, and told me as plainly as look could do, that "owd Brown," and what *he* would think of this new-fashioned crotchet of mine, was uppermost in his mind.

After an examination of my poultry and pigs, and briefly hinting at some fearfully heretical notions as to their management, we went into the snug shelter of my study, and taking sundry books from its shelves, I laid them on the table for the inspection of my friend. I meant to let him see what properly constituted agricultural authorities thought and wrote about cattle and cattle-feeding, that he might gather, if possible, some faint notion of "owd Brown's" position in the matter. Leaving him to this task, I for a while plunged into the sea of agricultural papers, picking out from its mysterious depths all sorts of odd bits and scraps as to prices, facts, &c.—it is odd how soon one takes an interest in the price of stock and so forth, when engaged in farming, even on the smallest scale—till seeing that my friend speedily laid down one book after the other, as in hopeless despair of getting any knowledge therefrom, I volunteered to explain to him, to the best of my ability, *viva voce,* the art and mystery of cattle-feeding on scientific principles. In thanking me for the offer, he said that what he had picked up did show

him a deal of matter about nitrogenous and non-nitrogenous, flesh-forming and heat-producing principles, and so forth, but that he could not help admiring the simplicity in operation of the old-fashioned methods of feeding; it "was more natural-like at all events." "At first it does appear so," I replied, "but, in reality, the correct is the easiest and quickest way to do a thing, however complex to the uninitiated it may at first sight appear. I am well aware," I continued, "that the old-fashioned farmers throughout the country think scientific men awfully crotchety, and sneer at them, perpetually parading their stock sentence, 'There's nowt like practice,' as if men of science denied its value, or as if, indeed, correct practice did not simply illustrate and foreshadow the truths of theory. Thus the generation of 'owd Browns,' not by any means extinct, nor likely, as it seems, just yet, have shaken, not seldom, their rotund sides with laughter at some of the 'crotchets' of men of science respecting the treatment of meadows, and the best way of securing good crops of hay; and have prophesied hard things, and have used hard names in connection with them. And really while the crotchety men have had—as has more than once happened in my confined experience—plenty of fodder, and the 'laughers' little or none, comparatively, I have felt a kind of pity for them, for they knew then very well who was best entitled to laugh after all, and which of the two, they or the crotchety men, were on 'the right side of the hedge.' Just so with all the 'new-fangled notions'—another expression very much in use with the 'owd Brown' species—about cattle-feeding, which have been so well illustrated in the practice of experienced breeders and feeders of late years. Such 'new-fangled notions' appear, I confess, to be very expensive affairs, but what if the result is—as, indeed, in nine cases out of ten is the case where parties carry them into practice—that they make money, whereas they who laugh at, and pass them by as worthless, lose it with their stock; the tables are turned with a vengeance, and I know very well what, in their heart of

hearts, the 'owd Browns' think of the 'turning;' for to do them justice, they know the difference between a good and a bad balance at the end of the season. And it is just indeed in view of this 'cuteness that men of science have hope that their improved practice, based upon correct theory, will ultimately be taken up and acted on by not a few of the 'owd Browns' before the present generation is quite out. In spite of the sneers of outsiders it is nevertheless a fact that there is a pretty fair aptitude among farmers of the present day to adopt new practices. At least, their promoters have often chances of obtaining a hearing, a thing not always so in times gone by."

Then I proceeded to explain the principles of cattle-feeding, thus:

Farm-food, of whatever kind, consists of two parts—an "organic" and an "inorganic." The latter is the portion which is obtained by burning or consuming the food, and constitutes what is called the *ash*. The ash, or *inorganic* portion of food, is made up, *first*, of insoluble earthy matters, consisting chiefly of phosphate of lime with magnesia, and is useful in adding to the bony structure of the animal: hence it is called sometimes "bone-formers;" *second*, soluble saline substances, as the chlorides of potassium and sodium; the sulphates and phosphates of potash soda; the office of these is to supply the blood and the animal juices with their various mineral constituents. The "ash," or "mineral matter" of food—for by this latter name also is the inorganic portion designated—plays a comparatively unimportant part in the constitution of cattle food; for nearly all its varieties contain sufficient mineral matter to supply the wants of the animal so far as its bones and juices are concerned; it is, therefore, to the *organic* portion of food to which the attention of chemists have been directed.

The organic portion of food is composed of a pretty wide variety of substances—as albumen, gluten, caseine, starch, gum, sugar, oil, and fibrin or fibre. These organic constituents of food, according to Liebig—the

discoverer, or at least the first expounder of the chemical theory of nutrition—are divisible into two great classes —the "nitrogenous" or albuminous group, and the "non-nitrogenous" or carboniferous group. The nitrogenous group is composed of vegetable albumen, vegetable caseine or lignum, and vegetable fibrin, which in wheat is called gluten. All these are marked by the presence of the four elements, carbon, oxygen, hydrogen, and nitrogen; hence the name nitrogenous compounds of food by which they are sometimes known. The use of the nitrogenised compounds of food is to build up, so to speak, the body of the animal partaking of them, by adding to its flesh, and repairing the waste of the tissues which is perpetually taking place. From performing this office they are generally described as "flesh-formers." And as, moreover, the eminent chemist Mulder considered the albuminous constituents of food to be compounds of protein, they are also sometimes designated "protein compounds of food." The names, then, "nitrogenous," "albuminous," flesh-formers, and "protein" compounds, are all synonymous, and may be, and are often indiscriminately used. I shall henceforth use the term "flesh-former."

The flesh-forming parts of food are named fibrin, albumen, and caseine or legumin; they contain the four elements, hydrogen, carbon, nitrogen, and oxygen, in precisely the same proportions. These elements *must* be present in all food before it is capable of building up the body, supplying flesh, and restoring the wasted tissues. Flesh-formers are obtained alike in vegetable and in animal food. Fibrin, for instance, may be obtained from fresh-drawn blood, or from the juice of a cauliflower; albumen from an egg, flour, or the juice of cabbage; or caseine from peas, beans, and milk. "The growth and support," says Dr. Lankester, "of an animal is now easily explained; when a flesh-eater, like the tiger, lives on the flesh of another animal, it eats, from a chemical point of view, the substance of its own body, and requires only to give it a new place and form. When a child receives its

mother's milk, it does the same thing, eating, in fact, its mother, and giving her flesh a new place and form in its own body. The nutriment of vegetable eaters is precisely the same; they find in vegetable fibrin, albumen, and caseine the substance of their flesh and blood actually formed, and have only to give it a place and position within their bodies. Vegetables are the true makers of flesh; animals only arrange the flesh which they find ready formed in vegetables. The *nutritive* value of food depends upon its richness in flesh-forming matter. An adult man, in vigour, wastes five ounces of dry flesh daily, and requires the same amount of flesh-formers in his food.

The *non-nitrogenous*, or second group of substances in food, contain three elements—carbon, oxygen, and hydrogen; but nitrogen, the fourth, is entirely absent. They are represented by starch, sugar, gum, pectin, fat, and woody fibre. The use of the *non-nitrogenous* group is to support the animal heat, and promote respiration; hence the substances composing it are called "*heat-givers*," "respiratory," or "carboniferous" compounds. When there is a preponderance of the "heat-givers" in food, more than is sufficient to maintain the proper temperature of the body, they are assimilated and produce a store of fat. But as the claim of the body to be kept warm must first be met, before fat can be formed, the importance of keeping up the warmth of the animal we are feeding and fattening, by shelter and other means, is insisted upon; for the warmer the body, the greater surplus of food will be left to go to the formation of fat. Heat, then, is said to be equivalent in some measure to food, so that there is good reason why cattle should not be left shivering in the frosty air on wintry days.

Heat is thus said to be, to a certain extent, food, the animal we fatten being compared to a furnace in which we consume our fuel. "The food," to quote the words of Dr. Playfair, "is the fuel, the excrements are the ashes, and the gases expired from the mouth are of the same composition as those which fly up the chimney of a furnace."

"Thus, non-nitrogenous substances are, in fact," says Dr. Lankester, "the *fuel* which keeps up animal heat. The body of a man has a temperature of 98° Fahr. This warmth results from the burning of those substances which produce as much heat in the body as they would if burned in an open fire out of the body. A man inhales about 3,000 gallons of air in twenty-four hours, in order to burn the daily amount of food-fuel, containing about ten ounces of carbon or charcoal. The products of combustion pass out by the mouth, just as they would fly up the chimney of an open fire were the charcoal burned in it. Less food-fuel is required in hot weather than in cold, and less in hot climates than in cold ones. Tropical foods contain about 20 to 30 parts in the 100 of charcoal; Arctic blubber and fats from 80 to 90. The intense cold of the polar regions compels the inhabitants to devour large quantities of food-fuel to keep up the heat of the body to 98°. Arctic travellers state that 20 lbs. of blubber is not an uncommon meal for one person."

The oily or fatty substances of food are found, like the nitrogenous substances of food in plants, "in the same or nearly the same state of combination as those in which it ultimately comes to be stored up" in the animal system.

"The plant elaborates from water and carbonic acid," says Dr. Anderson, "a variety of fatty bodies, from the solid, butter-like palm-oil to the perfectly fluid product obtained from the olive or linseed; and these are completely identical with the fatty and oily substances obtained from the different parts of the animal body. They are all compounds of carbon, hydrogen, and oxygen, the former element preponderating, and forming about three-fourths of the whole. Though similar in composition, they are not absolutely identical, although the differences are not so large as to be of much importance, at least in relation to their nutritive properties.

"Matters are very different, however, with the saccharine or starchy compounds, for these constitute a group altogether peculiar to plants, and are either entirely wanting in animals or present in quite infini-

tesimal quantity, and, so far as we at present know, only in some of the secretory organs, and that under particular circumstances; at all events, they are never met with in sufficient quantity to be of any importance. All the members of this group are identical in composition—starch and sugar, which are the most important of them, being, moreover, convertible substances, many processes being known by which the one may be transformed into the other."

The starch or sugar substances of food are not so valuable as heat-givers to the animal frame as the oily substances. If we represent the heat-giving value of these starch or sugar substances as 1, the value of the oily substances will be represented by 2½. Fat, however, in that wonderful alembic, the animal system, is capable of being formed from the starch and sugar substances of food. This is proved by the fact that animals become fat although fed upon food containing no fatty substances. The heat-producing and fat-producing substances of food may therefore, in one sense, be identical; so that if the heat-givers in any food are in greater abundance than is necessary to maintain the required temperature of the body of the animal partaking of it, the heat-givers thus in superabundance are not got rid of, but are retained in the system, and stored up as fat. The less, then, we draw upon any food for heat, the more have we left for fattening purposes.

The food-theory owes its origin to the services of the great foreign chemist, Liebig, and is generally received as correct throughout Europe. According to it, as strictly viewed, the *nutritive* value of a food is estimated by the quantity of *nitrogenous* matter it contains. This, also, was long held; but recently the English supporters of Liebig's general theory have seen the importance of the non-nitrogenous substances of food, and therefore hold it essential that, to constitute a valuable food, it must be a combination of the flesh-formers and heat-givers. On this point Professor Voelcker has the following:—"I am aware it was the fashion, not many years ago, to measure the feeding properties, and even the fattening qualities, of articles of food by the amount

of nitrogenous or flesh-forming matter; but these views are not supported by any practical experiments, nor, indeed, by the every-day experience that we have respecting not only human but cattle food. We pay more for food rich in nitrogenous matter, but which does not produce so much butcher's meat. It is a matter of much importance to the farmer to know how much he gets back for the money he expends in the purchase of food. I have no hesitation in saying that more money is made by the purchase of food which contains an excess of nitrogenous matter."

NUTRITIVE PROPERTIES OF FOOD.—Chemists have, with patient research, investigated and analyzed the various kinds of food used for cattle-feeding. Did time permit, I could give the results of such investigation; but, interesting and valuable as these would be, I content myself merely by giving here a table, showing the proportion, in 100 parts of feeding materials, of water, starch, and oil or fat. For the data of this table I am indebted to the "Guide to the Food Collection of the Kensington Museum," by Dr. Lankester:—

MATERIALS.	Water.	HEAT-GIVERS.		FLESH-FORMERS.
		Starch.	Oil or Fat	
Rice	13	74	0·7	—
Potatoes	75	15	0·2	—
Oats	13†	39	5·7†	17·0
Wheat	14*	59	1·2†	14·6
Beans	14	36	2·0	24·0
Barley	14†	48	0·3†	13·0
Peas	14	37	2·0	23·4
Buckwheat	14	50	1·0	8·6
Maize	14†	60	7·7†	12·0
Rye	13	51	1·0	13·8
Lentils	14	35	2·0	26·6
Carrots	86	11	—	—
Turnips	87	10	—	—
Parsnips	79	17	—	—
Mangold-wurzel	85	12	—	—
Cabbage	92	4	—	—

* Flour. † Flour or meal.

In the following table Professor Tanner gives (*Journal of Bath and West of England Society*) the composition and respective feeding values of the different classes of food:—

It is necessary to explain that the column marked "As proved" means, that by the consumption of 5 or 6 lbs. of linseed, as much flesh will be produced as by the consumption of 150 lbs. of mangolds; 6 lbs. of barley as 7 lbs. of oats, or 12 lbs. of clover or hay.

MATERIALS.	COMPOSITION.			FEEDING VALUE.	
	Non-nitrogenised matter per cent.	Nitrogenised matter per cent.	Water per cent.	As proved.	Per cent.
				lbs.	
Barley	56·0	13·0	14·83	6 to 1	16·7
Oats	55·0	13·6	12·8	7 to 1	14·3
Beans	48·5	23·3	14·8	8 to 1	12·5
Peas	50·0	23·3	14·1	8 to 1	12·5
Linseed-cake	13·52	28·56	8·6	5 or 6 to 1	16·7
Linseed-cake and Peas, equal parts	31·76	25·93	11·3	4½ to 1	22·2
Rape-cake	11·3	33·7	6·8	6 to 1	16·7
Cotton-cake	30·4	42·9	7·9	6 to 1	16·7
Clover-hay	40·0	9·3	14·9	12 to 1	8·3
Swedes	8·474	1·44	89·0	150 to 1	0·66
Mangolds	8·19	1·81	86·0	150 to 1	0·66
Carrots	10·0	1·5	85·0	160 to 1	0·66

"From what you have stated," remarked my friend, after I had finished the foregoing long explanation, "it appears that the true science of feeding is not so difficult to be understood; but it seems to me that it will be different in practice. I confess the theory is wonderfully ingenious; but will it not be a difficult matter to get *all* animals, with their different tastes and habits, to conform to one particular kind of food, however nutritious the analysis of the chemist shows it to be? Has the chemist ever taken into consideration the suggestiveness of the old proverb, 'What is one man's meat is another man's poison'?"

"You have shrewdly hit," I rejoined, "upon a point to which, in fact, I was about to advert when you spoke. I have already called the animal body which we have to nourish and fatten a 'machine.' Chemists have so called it, and have, with one or two notable exceptions, which I shall refer to shortly, to a great extent treated the matter as if it was this and nothing more. And the chemists have had for a long time pretty much their own way with the question; but the physiologist has lately stepped in, and while agreeing with the chemist that the animal is, in one sense, a machine, he claims consideration for the fact that it is something more—that it is an 'organism.' And while freely admitting the fact that it is important to know the nature of the *substances* of which food consists, it is equally important, nay, more so, to know the nature of the elementary *process* by which these substances are assimilated by the organism which they are designed to nourish. The various points at issue between the physiologists and the chemists are too numerous to be here gone into; I can only recommend you to consult the book in which the whole subject is most popularly as well as scientifically treated, namely, the 'Physiology of Common Life,' by G. H. Lewes, published by Messrs. Blackwood, only here requesting your attention while I read the following suggestive passage from this work:—

"'Only gross ignorance of physiology—an ignorance, unhappily, too widely spread—can argue that, because a certain article is wholesome to many, it must necessarily be wholesome to all. Each individual organism is specifically different from every other. However much it may resemble others, it necessarily in some points differs from them, and the amount of these differences is often considerable. If the same wave of air, striking upon the tympanum of two different men, will produce sounds to the one which to the other are inappreciable; if the same wave of light will affect the vision of one man as that of red colour, while to the vision of another it is no colour at all, how unreasonable

it is to expect that the same substance will bear precisely the same relation to the alimentary system of one man as to that of another! Experience tells us that it is not so.' After citing a number of facts with which I need not now trouble you, proving that different classes of the same species of animals live on different food, and that strong vegetable poisons are food to many animals, Mr. Lewes proceeds thus: 'We have brought these facts forward for the sake of giving distinct relief to the importance which must inevitably belong to physiological considerations in every question of food, and to indicate the necessity of fixing our attention on the *organism* to be *nourished*, rather than on the chemical *composition of the substances* which nourish it. When we are building a bridge, or making a machine, we can accurately guide ourselves by estimates of the strength of the wood and iron, because these substances do not lose their properties under new arrangements; but in building the mysterious fabric of the body, we have little or no guidance from our estimates of the properties of substances *out* of the body, because the body itself is an important factor in the sum, acting on the substances, as well as being acted upon by them, annulling or exalting their ordinary properties in a way quite peculiar to itself.'" On concluding the reading of this sentence, I expressed my fear that I had by this time fairly exhausted his patience, but that as he had started the point, I was anxious to show him how far his shrewd guess was correct, and how it certainly appears that the physiologists must have something hereafter to say in making clear the doubts which still hang about a subject the elucidation and examination of which has as yet been mainly left in the hands of the chemists. But it will not do to keep out of sight the immense benefits which chemistry has bestowed upon agriculture by its researches into the nature and composition of food. Nor have many of the physiological points of the question been overlooked by some of our chemists, as witness Dr. Voelcker, one of our ablest expounders and most

patient of investigators of all matters relating to agricultural chemistry.

Many chemists, however, still, to a great extent, maintain the importance of attending to the analysis of a food as the only trustworthy index to its economical value. Physiologists on the contrary, not only maintain that chemical analysis cannot and does not alone give this index, but further—and this opens up many considerations of extreme interest—that the theory of food, so generally received, is in itself wrong, and that its acceptance leads to errors of the gravest importance. The issue being thus as between chemists and physiologists on so important a point as the "food question," it behoves all interested in the progress of a most important branch of practical agriculture to know the case as put by both sides, and, while hearing the evidence brought forward, to examine and see whether these things be so or not.

It will be suggestive, therefore, to take into consideration here *some of the circumstances of practice which modify the value of feeding materials.* That chemistry has rendered valuable service to the practical feeder there is little doubt; but at the same time it must, I think, be admitted that some danger arises from taking as guides, safe under all circumstances of soil, locality, and animal peculiarities, the results of those analyses of foods, and classification of the effects which their constituents are presumed to produce, which have of late years been so widely circulated. An analysis of any product of the farm may be given, and certain feeding effects predicated from its use; but it by no means follows that this analysis will represent correctly the feeding value of the same kind of product grown in a locality where the soil or climate may be of a very different character. The chances are all in the opposite direction, and the probability is that the material, though the same in name and variety, may be of high feeding value in one, and low in another locality. True, this difference is not to be put to the discredit of the chemist, who may have made the first analysis; it

arises rather from the mistaken notion of the feeder, who takes it for granted that the analysis of any material grown in one place will represent precisely the value of the same material grown in another. For instance, the nutritive value of oats grown in Scotland is higher than when they are grown in England, the case being the reverse as regards barley. The highest authority on such matters states that this fact has been well established by several analyses. Again, Mr. Ruston has shown that, while mangolds grew luxuriantly in his soil, they possessed no very high nutritive value, while turnips are not worth the growing, as regards feeding value. How misled under such circumstances one would be if he took for a guide in practice the analyses of the same feeding materials grown in another locality as given by some chemist. But we do not require to take, by way of example, the products of localities separated by wide intervals of country; for the practical man has often abundant evidence of the different feeding value possessed by produce grown, not only on two contiguous farms, but even on different parts of his own farm. The value of the produce must be, and is, influenced by the modes of treatment as well as the nature of the soil. It would open up, for instance, a very interesting inquiry, if we could institute rigid experiments as to the feeding value of produce grown on precisely the same soil, but under different treatment, application of manure, &c., &c. Produce grown on a poor, exhausted soil cannot possess the same qualities, be they good or bad, as that grown on carefully-prepared and highly-manured soil. The season, too—the absence of rain or the superabundance of it—will also influence, in a more or less marked degree, the qualities of produce; and even the period at which it may be harvested will have its influence too. The period for which produce is kept before being used also exercises an influence on its feeding value. This we know, that mangolds are much more nutritious, or at all events more wholesome—and, in the feeding sense, the two terms may be used syno-

nymously—when given to stock in December or the spring, than when taken newly up. Weeds, too, exercise a baneful influence on the quality of produce; and often a mysterious, at least unknown, peculiarity of soil or herbage will make the one side of a valley a very Golgotha for sheep, while the other side may be a Paradise. The different effect of the same food on different animals is a point also worthy of consideration; but to this I shall refer in process of time, and fully, as its importance indeed deserves.

Chemists themselves have directed special attention to the danger of supposing, as many do suppose, that chemical analysis alone determines the value of a feeding material. On this point Dr. Voelcker has some remarks pregnant with meaning. "We are too much in the habit of speaking of cake," he remarks, "turnips, mangold, or hay, as if these complex mixtures of substances were simple chemical combinations; whereas the differences in two samples of the same produce are often very great. Any one who has tried practically the nutritive effect of good and badly made hay, or of turnips grown on good turnip land and on peaty land, knows well that there is a vast difference between hay and hay, or a turnip and a turnip. In speaking of the nutritive value of any article of food, too precise a language is out of place; and it is simply absurd to draw nice general conclusions from small differences which the analysis of different feeding materials may have yielded. Unless the differences are strongly marked and constantly observed in a great number of cases, it is unsafe and irrational to attach a precise nutritive value to different articles of food, especially if the opinion is founded solely on analytical data, and not corroborated by actual experimental trial."

The nutritive or feeding value of a food is greatly influenced by certain conditions frequently connected with it. Thus, as Dr. Voelcker points out, the prejudicial substances which it may contain, the mechanical effect which it exercises, the physical condition of the food, the flavour which it imparts to the flesh or milk, are

all circumstances influencing the value of a food. Thus, rape or oil-cake may contain a large percentage of mustard, and the sweepings of food stores may have bad material mixed up with them. In that case, the food is not only innutritious, but absolutely hurtful. Again, bran, for instance, although in reality, so far as chemical analysis shows, more nutritious than the whole grain, exercises such a mechanical effect in passing through the system, that it not only induces relaxing effects, but passes through, to a certain extent, undigested altogether. The effects of musty or a bad condition of food—as hay—are too well known to be much dwelt upon here.

The observations I have here made may be taken as a few suggestive notes on a subject, the importance of which is sometimes overlooked; but there are other points which are full of interest, and which exercise no small influence in modifying the feeding value of farm produce. The consideration of these points brings us more closely in connection with the science of physiology than with that of chemistry. And on this point, connected with what may be called the peculiarities of *inner* life, I may state at the outset that comparatively little is known which may be taken as correct and trustworthy. As yet, conjecture is nearly all that we can indulge in; and although facts are certainly being brought forward repeatedly which will ultimately tend to place the science of life on a more secure and better-understood basis, at present these facts, so called, are so scanty, and some of them are so open to be disputed as being facts at all, that little can be predicated with certainty from them. Indeed, we may, with the philosopher, paradoxically affirm that, as regards life and its wondrous secrets, what we know shows us that we know nothing. Yet the observations which I thus have here presented to the reader are full of suggestive interest.

That the peculiarities, temper, disposition, and age of the animal we feed exercise a modifying influence upon the feeding value of the materials employed, is well

known. One likes straw, another hay; roots are eagerly devoured by some, which are eaten as if with palled appetites if not turned from with disgust by others. The milk of cows will increase and diminish, will assume a variety of conditions of the most diverse character, and these succeeding each other sometimes with singular rapidity, and as singular an uncertainty. The food relished by them to-day will be turned from with disgust to-morrow; and while one breed does well with one kind of produce, another breed cannot thrive upon it at all. The same food, too, with the same animals, will produce precisely opposite effects one day from those brought out upon another, according, apparently, to the condition of the animals, whether they are quiet and gently treated, or disturbed by fear or ill-usage. The weather, doubtless, too, acts as singularly upon some animals as it does upon the human frame, bringing with it fits of depression, or, on the other hand, a flow of animal spirits, and influencing, it may reasonably be conjectured, their physical condition accordingly. Dr. Voelcker very clearly points out a variety of circumstances connected with the condition of the animals as modifying the value of the food with which they are supplied. Of these points a *résumé* will be found in "Hints for Farmers" (Warne, London).

CHAPTER XVIII.

ENSILAGE—ITS CHARACTERISTIC FEATURES, AND GENERAL STATEMENT AS TO ITS PRACTICAL USES IN THE PRESERVATION OF GREEN-CUT FARM CROPS, TO BE USED FOR THE FEEDING OF LIVE STOCK AS A SUBSTITUTE FOR HAY AND OTHER FEEDING PRODUCE.

THERE has been no system connected with fodder introduced in modern times which has excited so much attention, which has so quickly risen into importance, and which has been accepted so widely and so rapidly as that of ensilage. Nor need this be matter of surprise, seeing that it promises to give what is virtually a new power to the farmer in the feeding of his live stock. We purpose, therefore, devoting a very important space in fully describing this new system. And we do this the more readily, not merely on account of its importance in the present adverse circumstances of farmers, but because, in our treatment of it, we shall have an opportunity of entering into details which will be useful to the small farmer in departments of his work other than that of ensilage.

Such frequent reference has been made in the public journals and magazines to this subject as one of the greatest importance to farmers, graziers, and dairymen, that even those who are not connected with agriculture must have had their attention more or less directed to it. And, as is generally the case with anything which has the attribute of decided novelty, especially if it be likely to meet some pressing need, there has been in this case no lack of that sanguine hope which sees only such perfect success in the application of the new way to meet the old difficulty as to lead to the conclusion that

means quite a new era of good times for farming will be introduced. This mode of considering a new project is no new thing in the history of farming. Contrary to the popular opinion, the farmer of modern times is remarkable for the eagerness with which he listens to new schemes promising to help him in his work and to make it more profitable. And, although popularly considered to be the slowest of the slow, he is so ready to spend money in the trial of new schemes and new machines and implements that his best and most prudent friends have rather to warn him of the danger of spending his money heedlessly on things which may not repay him, than to urge him to try new things. Evidence of the truth of this, which to many will be a novel statement, is to be found in the records of modern farming; and there is perhaps no evidence of it more striking than the extraordinary rapidity with which the manufactures of agricultural manures, feeding-stuffs, and machines and implements have progressed, till now, in the amount of capital invested in them, the work they produce, and the number of hands they employ, they form most important departments of national technical and industrial work.

Now, in connection with the subject of ensilage, this tendency of farmers to look favourably on all new things promising to promote their interest, taken along with the highly exaggerated views promulgated by some as to what it will and must do to cure the evils which have so long depressed farming as a technical calling, is likely to cause some connected with its business to form hopes of its value so high that they cannot be realised. In all new things which possess certain marked features of true practical utility, it is wise and prudent to ascertain as clearly and as fully as possible what they will *not*, as well as what they will do. As has been well remarked by a shrewd business man, in technical and industrial investigations the answer *No* is just as valuable to the prudent man as that of *Yes*. If not in the present, in a subsequent chapter on the subject of ensilage, we may find space to point out to the

practical farmer the possibilities of the system in helping him to overcome the difficulties of his position, and how far these possibilities are likely to extend, and how best to avail himself of them in a practical and paying way. Meanwhile we proceed to explain first what ensilage is; to touch on one or two points bearing upon this—and then to describe briefly the best method of carrying out the system.

For a long period—so long, indeed, that we have no record of the date of its introduction, or of the nation by which it was introduced—it has been the habit of many farmers who grow wheat in certain districts on the Continent where the climate is dry and genial and the temperature ranges regularly high—such being the best climatic conditions for wheat-growing—to store the grain up in pits dug in the natural soil, or in excavations made with greater care and harder toil in the rock. This system, when carefully carried out, is very successful in preserving the grain food for long periods of time in a thoroughly sound condition. It is so suggestive of many practical points bearing on the preservation of food substances, that we may return in a future chapter to its further consideration. We here refer to it, as it seems to have given rise to a corresponding system for the preservation of farm produce of a totally different character from that of wheat or grain, carried out in other districts on the Continent which either by their natural dampness, or the heaviness or frequency of rain, offer almost the reverse of the climatic conditions met with in the wheat-growing districts we have referred to.

In some of those damper and colder continental districts it has been long the practice—how long it is as difficult to say as it is in the case of the wheat-growing districts referred to—of the farmer to dig pits and to store up in them what is called forage produce, chiefly grass, although the practice has been in some instances extended to the leaves of plants, such as those of mangold or of beet. The produce as grass is cut in its green state, put in layers in the pit, and a quantity of

salt sprinkled between them. The whole is then firmly stamped or pressed down, and when well consolidated by the simple means adopted, a covering of soil is put over as a finish, and this also is pressed or stamped firmly down.

Green-cut grass thus treated is found to keep for a long time, long enough in all cases to tide over the period of a full season or year, and frequently for a much longer period than this. When the contents of the pit are required for use it is partly opened, and the compressed material is cut down vertically, keeping to one end or side of the mass, just as one cuts down supplies of hay from a haystack. The object of this is obviously to retain the quality of the compressed mass as long as possible, and not to open it up to the influence of the atmosphere. The green stuff thus obtained is found to form an excellent and nutritious food for cattle, and is so liked by them that it is generally eaten with avidity. The grass when taken out and chemically examined is not the same as when put in and first compressed, certain changes having taken place in its composition.

At first sight it will to many appear that the preservation of the mass is due to the conserving qualities of the salt used. This is not the case, inasmuch as we shall hereafter see the use of salt in the modern or improved system of ensilage is to be deprecated rather than recommended. The chief preservative influence arises, in fact, from the way in which air and moisture are excluded by the close compression of the mass, and by its being covered over with a protecting roof of soil. This point will be further gone into in its proper place in this or in a succeeding chapter. This continental custom of pitting green-cut grass, like many others which possess intrinsically good and practically valuable peculiarities, was long carried out without, so far as is known to the contrary, any attempt to improve the system, and bring out more fully its valuable features; and like many other departments of technical and industrial work, it had to wait till the "time" came

when its improvement was to be taken up, and the man by whom it was to be carried out. The time was some thirty-five or forty years ago; the man was M. Goffiert, a continental agriculturist. It struck him that the rough-and-ready pit system possessed capacities of great value to the live-stock feeder if they were developed by a more accurate system of pit arrangement and construction, based on what appeared to him to be the true principle of preservation. This principle he closely studied, and the result was not merely that he hit upon a good method of constructing the pits, but he saw that it was applicable to other farm produce than grass or leaves—indeed, to a wide range of crops. Not content with improving the pit itself, but also seeing that if applicable to several crops there would be some crops better fitted to bring out the best qualities of the system of preservation than others, he set himself to find out what crops were the best to grow specially for it. So successful were his efforts in both directions that he deemed it to be his duty to publish the results in a small pamphlet, in order that his neighbours, if not his countrymen generally, might profit by them.

But if the time be that of the man who improves, it does not always follow that it suits the time of the public which should benefit by the improvements. An improver is often before the public time. It was so in this case. M. Goffiert's pamphlet fell unheeded, so to say, on the public soil, and seemed destined to bring forth no fruit. But by one of those curious circumstances which form what may be called the "romance" of technical and industrial work, a copy of the pamphlet fell oddly enough into the hands of a traveller from the United States of America. Struck with its facts and the practical character of its remarks, he determined on his return to the States to try the system. This trial was so practical and so complete, that he in his turn, anxious to serve his brother agriculturists, published a special work detailing his experience and showing how the system could be carried

out with all its practically valuable features. This work met with a better fate than that to which in fact it owed its existence. The time of the public had come for the reception of this old scheme with a new face. The press and the agricultural societies of the United States and of Canada took it up heartily. Numerous trials were made and their results registered. In process of time the wave of public opinion thus rolling high and strong on the new continent crossed the Atlantic, and striking the shores of the old continent gave back to it what it had parted with years before. Our own island experienced also the influence of this wave of American opinion, and an interest was excited in agricultural circles of which we now see some of the practical fruits, and are from present indications likely in the future to see others, and those still more valuable.

To the pit or receptacle—for it is not a necessity of the modern system that the preserving-place should be a pit in the sense of an excavation or dug-out place—in which the mass of green produce is stored up the name of "*Silo*" is given, and the term Ensilage, which is derived from this, denotes the system of preservation. A high authority on the subject proposes to extend its nomenclature by giving the term "Silage" to the green produce which is preserved.

Before proceeding to give details of the system, so far as construction of the silo is concerned, we conclude this chapter by an explanation in popular terms of the features of the system. The silo is essentially designed to effect the exclusion of the atmosphere and moisture from the mass stored up in it. This points to a pit so constructed that its boundary sides and its bottom surface shall be absolutely impenetrable to all moisture existing in the soil in which the pit is dug, and that precautions be equally taken to prevent the moisture, or rather wet of rain or snow, falling on the top of the pit, this requiring a roof or covering of some kind impervious to moisture. The pit, therefore, popularly described, must be "waterproof." This

quality must also exist, it is scarcely necessary to say, if the silo be constructed above the ground level, either specially constructed or adapted from some existing building.

Another essential feature of the ensilage system is the exclusion of air. This is secured by thoroughly compressing the layers of the mass together, so that it be throughout practically solid. At present the means to obtain this are, first, pressing down by bodily force, then stamping on the surface of the layers; and second, increasing the compression and keeping it up by a permanent weight, as of heavy soil placed on the top of the last or upper layer. And those features, popularly explained, obviously point to this, that ensilage is a somewhat costly process to carry out efficiently.

CHAPTER XIX.

THE ENSILAGE SYSTEM OF PRESERVING GREEN-CUT FARM CROPS AS FOOD FOR LIVE STOCK (*continued*).—THE "SILO" IN ITS TWO FORMS, THE PIT, OR UNDERGROUND, AND THE ABOVE-GROUND SYSTEMS.

WE have instanced a pit as the primary form which the silo assumed. But it does not follow that a "pit," that is an excavation made in the soil below the level of the ground, is the only form in which the silo can be made. So long as the essential features we have named above are secured, it matters not how the silo is made. It may thus be, instead of a hollow pit below, a receptacle constructed above, the level of the ground. The small farmer will be guided by circumstances as to which of the two systems he will adopt. The great point with him is to have his silo provided at as small a cost as possible. The amateur farmer need not be so very particular on this point, for here as elsewhere in the work, we use these two terms as indicative of the two classes of men who carry out farming on the small scale. The amateur farmer in many cases treats farming purely as a hobby, and therefore is probably desirous of having all his appliances of the best kind, this being very frequently a characteristic of those who have a hobby. While he, therefore, may be indifferent as to cost, the small farmer, who has to make a living as best he can out of his land and the stock he keeps, is so far from being indifferent that he must examine every cause of expenditure in the most careful way so as to lessen it as much as possible.

We have said that in regard to the silo the small farmer will be guided by circumstances, such as locality, soil, &c., as to whether he will dig his pit below or erect

his chamber above the soil. He must recollect that while deciding upon one of these methods as the easiest to be made and the cheapest, that the mere fact that one form is lower in first cost than the other does not bring with it as a necessary consequence that it will be the cheapest in the end. He has to consider the cost of working it. Now it will not require much knowledge of what work is to understand that taking the work of silo management all round it will be more easily and more quickly done when the silo is in a pit or excavated chamber below, than when it is a structure raised above, the level of the ground. In larger farms, while the mere size of the silo will justify and even positively demand the employment of mechanical means to aid the work of ensilage, it may be found that the best system to adopt is the above-ground silo chamber. But taking the circumstances of the small farmer generally, we should be inclined to recommend him to adopt the pit form. The making of it will be easier to him than the building of a structure above ground-level, as this last-named form will require him to hire skilled labour to construct it; and skilled labour is always costly.

We have seen that one of the essential requisites for a silo is that it be waterproof. This at first sight would seem to militate much against our recommendation that the small farmer should make his silo in the form of a "pit." For in this case the drainage or soakage of the water through the sides of the pit would be an evil not easily prevented. In many cases this prevention could be more easily secured than would appear likely at first sight. We see in examining the system of ensilage with a view to see how far it is likely to be a great help to farmers, that as a rule its benefits will be more striking in the case of heavy land than in that of light soil farms. Now a heavy soil offers greater advantages for the construction of a silo on the pit system than a light one. But even in a light-land farm it often happens that small patches of dense heavy soil exist, and one of these may be near or upon the site of the farm buildings. Some clays are so dense that drainage

or soakage of water through them is a matter of much greater difficulty than it is in the case of light permeable soils. Now, if by a trial-pit or hole or two the small farmer comes across a piece or patch of dense retentive clay, he may conclude that he can have the cheapest made silo possible. The best site for a silo of this kind is on a piece of ground which slopes away on all sides; the next best, almost as good as the first, is when it slopes gradually in one direction. The site thus placed can be kept well freed from water by making a drain to run along the lower side of the slope. The deeper this is the better when the soil is very heavy, that is, a dense, impenetrable clay; if the bottom of the pit be thoroughly well rammed down and the sides beaten with a spade or pressed well in, there will be comparatively little chance of the sides falling in.

But while it would be pretty free from actual drainage water, the surface of the pit would be certainly damp, and clay, close as it looks, is a medium through which water percolates very much more easily than many are inclined to believe—a peculiar feature, however, well known to those who have had experience in the draining of heavy clay soils. Still the percolation of water through the sides and bottom of a silo pit in a dense clay will be reduced to a minimum by ramming and pressing close the surface of the pit. We had a pit in a soil of this kind; and, although the winter had been a specially rainy one, when it was opened and emptied in the spring, it was found, to the surprise of some who saw it, that the sides and bottom surfaces were comparatively free from even moisture, while no drainage water had collected in the pit. However, we had taken the precaution to run a drain all round the pit, as its site was by no means favourable to what may be called the natural drainage of the water in the body of the surrounding soil from its neighbourhood. This drain was, however, shallow in relation to the depth of the pit, although considered as an open or surface drain —for it was only this—it was deep. Experience points, in this case at least, to the fact that in excavated pits

of this kind there is more danger of wet getting in from the top and the upper part of the sides than from percolation through the bottom and general surfaces of the sides. Hence it is essential in all sites that they be covered over to protect them from the rain and snow fall.

Where the utmost economy in forming a silo is desired, as with many small farmers is absolutely necessary, it may in such a soil be made in its simplest elements in the form of a mere excavation, care being taken to finish the bottom and side surfaces in the way we have described. And when the silo is filled it may be covered over in the most complete and perfect way attainable by the use of such cheap and readily available materials as may be at hand. No doubt there is considerable risk that a silo thus constructed in a cheap, simple fashion will not be successful in a completely satisfactory sense; that a percentage of the "silage" or food preserved by it would be lost may be almost certainly predicted, but that the whole of it would be so we do not believe, that is, if the "silo" be properly managed in the filling in of the green-cut food to be preserved. This opinion is based upon what experience has shown in the case of simple pits; and in view of the whole circumstances, and giving the widest possible margin to the chances of failure, we nevertheless would say to the small farmer thus:—Looking at the great advantages you would obtain in your heavy land farm by the adoption of the ensilage system of obtaining a cheap supply of nutritive food for your stock, we think that it would be worth your while to run the risk of a partial loss through the incompleteness of your silo and have one. For we believe that the gain, even in the event of the loss being greater than may be fairly anticipated, would be such as to leave the balance largely in your favour. If we were in your circumstances we should run the risk; and there is this probability still more in favour of your doing so, that the first year's experience with your silo, constructed in the cheapest possible

way we have described, may give you such hints for its improvement in the future, that it may, at a mere trifle of extra expense, be made practically perfect. At the worst you can only lose the food you try to preserve in this simple silo, for the digging or making of it will be but a trifle. For, if you are a wise man, seeing that you run a risk of loss, you will take care to lessen the cost of the trial by digging your pit and filling it in extra time. We repeat, at the worst you will only lose your produce, but we do not, judging from experience, believe that the loss will be anything like total. If you are careful in filling in the pit with its produce, we feel assured that, with this silo, it will not, at the very worst, be all loss you experience.

There is no doubt upon this point that, if ensilage is to prove a practically valuable help to the small farmer, some system other than that at present generally in use, and almost universally recommended by all authorities who have written about it, must be adopted. The system must present the feature of much greater cheapness than that thus universally recommended. And there is no class of farmers who require to be helped in the difficulties which beset all farmers nowadays more than do the small farmers. Those of this class have as a rule, with few exceptions, little money in hand, and they can afford but little of that which they have to lay out in the way of buildings or appliances of any kind needed. It may be said that the silo should be erected at the cost of the landlord, and no doubt this will in time be done, that is if the system of ensilage is proved to be—as in all its practical aspects it is likely to be—of such value that it will take its place as an adjunct of the farm buildings or steading as necessary to it as the barn or the shippen.

Although it may be said of ensilage that the results of such trials as have been made have been so exceedingly satisfactory, that of all the different systems introduced of late for the purpose of helping the farmer, it alone has offered such real practical value as to be worthy of a regular and permanent place in

farm work; yet landlords in the present stage of its history may be well justified in claiming the right to be allowed to wait for further and more extended experience before they decide to lay out money in making the silo a part of the regular and ordinary appliances of the farm. It is not wise to decide off hand that we have had experience enough of the system to justify us in assuming that we now know all its capacities, and that those are beyond doubt of the highest value, and that we have nothing further to learn as to how those capacities may be increased, or with respect to the practical way in which the work may be carried out. This style of what is assuredly hasty and premature decision is against all the lessons which experience has taught us in regard to improvements in branches of industrial works other than that of farming, and indeed by many improvements in this art itself. No matter how sound the principle of any improvement is at first shown to be, no matter how perfect the mode of carrying that principle into practice appears to be, all experience has shown that it is only by repeated trials, and those in most cases accompanied by failures more or less decided, that the true capacities and the permanent features of the new process or method are found out. The method of to-day gives place in some detail or another to the improved method of to-morrow, till the weak points in the system are one by one eliminated, and it is accepted as the best way in which the principle can be carried out.

And this will, beyond all doubt, be the history of the system of ensilage, should it actually take its place as one of the permanent parts of English farming. And this much may be said of it, and assuredly it is a great deal, that all the indications afforded by what has been already done with it go strongly to prove that it is exceedingly probable that this permanent position will be given to it. But few practical men acquainted with business improvements will be found to assert that all we do now know about the system is all we shall ever know. Practical men know better than to say

this—and for our part we have no hesitation in believing that the results of future experience will, in conjunction with that of the past, be such as to indicate if not actually the best method, at least the direction in which it is to go, by which a system of carrying out ensilage in future will be discovered cheaper and equally effective, if not more so. No one denies the fact that as a system it is but as yet in its infancy, and surely no one will assert that the characteristics of this the earliest and weakest period of its existence will be those of its riper years. That ensilage will have new developments, and that experience will show easier and more economical methods of deriving the fullest advantages from it than any yet introduced, we fully believe. If we did not believe this we should belie or certainly forget all the lessons taught us by the progress of the industrial arts of the last hundred years as recorded more or less fully in its history.

Meanwhile, until we really know all the powers and capacities of the system of ensilage, and have a much wider experience than we now possess of all its constructive and practical features; and until silos and all their attendant appliances will form as regular a part of farm buildings and conveniences as the barn or the stable, and therefore be provided by the landlord as a matter of course—those farmers whose landlords refuse to construct silos for them must, if they decide to have them, fit them up themselves, and at their own cost. And this will, we expect, be the circumstances of the small and the amateur farmers of the kingdom for some time to come at least. While the small farmer cannot be expected to do much in the way of trying ensilage in a complete way, the amateur farmer on the contrary may be reasonably expected to do a great deal. And as we have in another place drawn attention to the good service amateur farmers may do in the cause of experimental agriculture generally, we would suggest to them an exceedingly good outlet for this in experimenting upon ensilage in all its aspects. That is, not merely the best and most economical methods of securing

and saving green food, that is the making of silage—but in the direction of ascertaining its true feeding value and to what "stock" it can be applied. Amateur farmers are, as a rule, men of means, and as they go into farming to gratify a hobby or realise a fancy, and have generally a great desire to make experiments, they may as well—nay, it will be a great deal better if they do—experiment in a systematic way and in some useful direction promising to be more than usually practical. And ensilage meets this position.

We have already explained how the small farmer with limited means may make a silo in the cheapest way in the pit, or below-ground-level system, and have shown how, where his soil is heavy, he may make one which will, to a large extent, give fairly good results. But those results he could scarcely expect in the case of light soils. In these, in fact, he would find a great difficulty in keeping the pit he might dig in "form;" the sides would be continually falling in, especially under the work of filling in. And then, again, which is a still more important point, the percolation of water from the surrounding soil would in such light land be very great in wet weather: the sides and bottom of such pits would be like a sieve in certain conditions of the weather. A lining to the pit would in such cases be necessary. The cheapest of all would be rough timber slabs, placed along the bottom as well as all round the sides. If placed edge to edge, even with regularly sawn planks, there would be joints so open that a good deal of water would percolate through to the interior. But with "slabs"—that is, the outsides of logs or bulks of timber—the edges are so rough and uneven that wide spaces would be left if they were placed edge to edge. The boards should therefore be placed so as to "overlap" each other at their edges, and this overlap should be so wide that, in the case of slabs, the uneven edges would lie quite even on the solid part of the slab below. This method of laying is illustrated in the well-known style of forming the sides of wooden sheds or of wooden roofs to which the name of "clap-

board" covering or "weather boarding" is given. Another method of securing a fairly water-tight joint where regular "planks"—not slabs—are used, and in which the edges are cut "fair," is by bringing the boards quite close together and then covering the joint with a slat or roll of wood, about an inch and a half or two inches broad and three-quarters of an inch or so thick. Great care must be taken in securing these to the boards to nail *them* on *one* edge only, that is, the nails must be driven in to give the slats or strips of wood a hold on one of the two contiguous boards only. If the slats are nailed to both edges, that is, securing them to the two boards, they will inevitably be split at the nail parts by the expansion or contraction of the boards. But by nailing the slats to one only of the two contiguous boards, one of the boards is free to move without dragging, so to say, on the slat or roll at all. This "wrinkle" in construction for general woodwork is worth knowing; we have seen cases in which no end of mischief has been done by neglect or ignorance of it.

CHAPTER XX.

PRACTICAL NOTES ON THE CONSTRUCTION OF THE SILO.—PORTLAND CEMENT CONCRETE CONSTRUCTION, AS APPLICABLE TO A WIDE VARIETY OF FARM STRUCTURES OTHER THAN THE SILO, SUCH AS MANURE PITS, TANKS, STABLES, SHEDS, PIGGERIES, AND THE LIKE.

WHEN the pit or below-ground style of silo is deemed preferable, by far the best plan is to line it with a waterproof interior; and this can only be executed in the most perfect way by means of Portland cement concrete. It is much cheaper than a lining of brickwork set in cement, and brickwork set with ordinary mortar will not give a water-tight lining. At least, if it does so at first, it will only keep good for a time more or less limited, and that at the most for not a long time. Further, brickwork requires skilled labour, whereas any day-labourer can make a lining in Portland cement concrete, the work being of the simplest kind. We have employed men who had never executed any kind of constructive work in concrete building, who, from the very first, proved competent to do even what might be called, and indeed was, from a bricklayer's or mason's point of view, work of a very complicated character. Again, as regards the soundness of the work in concrete, there is no material which can come up to it in real value, far less excel it. A pit lined with it is, when completed, a monolith as perfect as if it had been hollowed out of a solid block of stone. And, in fact, it is better than the stones usually met with; for while these are generally pervious to wet or damp, the concrete is absolutely impervious.

As this material is so exceedingly valuable for a great variety of purposes on the farm, in addition to

silo making, such as liquid manure tanks, farm-yard manure pits, water-tanks, and for floors of stables, cattle courts, yards, &c., &c., we deem it likely to be of some practical service to our readers if we give here a few notes on the working and using of Portland cement concrete; and for this purpose we reproduce here the principal points of a paper which we wrote for the pages of the *Journal of the North and West of England Society* under the title of "Brief Hints on the Construction and Arrangement of Farm Buildings."

The mode of building, or rather of constructing, walls in earth known as "pise," or hard-rammed soil, and with which our readers are doubtless acquainted, probably led to the use of concrete as a substitute for the earth, as possessing the capacity for being more easily worked and for much greater strength. Concrete may be defined as a mixture of gravel, stone chips from quarries, or from the preparation of stones for building purposes, cinders, clinkers, broken bricks, or the like, mixed with lime or cement. Where lime is used as the material to bind the substances which form the bulk of the concrete, the concrete is used for the making of foundations; but where it is required for building purposes, an hydraulic cement is employed to bind the broken bricks, &c., used as the bulk of the material. The cement almost alone used now is that known as Portland, which, in fact, is the most valuable of all such cements. It is made by mixing definite proportions of chalk and clay, mud and carbonate of lime, or of certain mineral nodules found in certain rivers, the waters of which flow over clay and chalk. These are calcined at high temperatures, and thereafter ground into a fine powder. In this country the Medway, or rather the bays and creeks on the sides of it, affords the best material. The cohesive strength of the cement made from these materials is very great, four times as much as that of the best hydraulic lime. When mixed with broken bricks it forms a concrete which is stronger than Portland stone in the propor-

ion of 2·280 to 1·480. In purchasing Portland cement it is well to specify the weight per bushel. A good quality is that which weighs 110 lbs.; some authorities prefer as lighter cement a 100 to 105; but the weight of experimental evidence is in favour of the heavier cement.

We have named a number of materials of which Portland cement can be made, but to those may be added the nodules of burnt clay (clay can be burnt at a cost of 1s. 6d. to 2s. 6d. a cubic yard), broken glass and crockery, hard chalk and chalk flints, broken slags from iron furnaces, and, indeed, almost any materials which form hard compact lumps or nodules. Where these vary in size, the large lumps may be used to pack the centre of the wall, the thinner concrete being used to bind the whole together. For the making of floors and the covering of flat surfaces, and of projecting parts of buildings, such as the mouldings or dressings to windows, doors, string courses, and the like, sand or fine "breeze," or ground bricks are very valuable. It is surprising how rapidly a floor surface is laid with the concrete made with the "cement" and those last-named materials. Where fine breeze cannot be obtained, sand is generally available; that known to builders as clear, sharp, dry river-sand is the best. Indeed, for floor-making purposes we prefer the sand to the fine or powdery breeze. The proportion of the Portland cement to the broken materials used for making the concrete differs according to the practice of various workmen. Some use so small a proportion of cement as one part to eight of the materials, others seven; but a safer proportion is one part of cement to six of the materials. This we adopt in our own practice, modifying the proportions, however, according as we require in some parts a greater strength than in others, a pillars or narrow pedestals, in which case we use a great a proportion as three parts of the cement to eigh of the material. The best way of mixing the materials is to have a platform made of strong boards, we clamped together, which may be of any convenie

dimensions, as 7 or 8 feet square. This is laid upon the ground in close vicinity to the place where the building is to be erected. The gravel, broken or crushed bricks —of a size to pass through the meshes of a quarter or half-inch sieve or screen—are then placed upon the board, together with the cement in the proper proportion, and the whole well mixed together in a dry state. When the mass is well mixed, water is sprinkled over it, gently at first—best done through the rose of a watering-pot—and applied till enough is given to enable the cement to adhere to, or become incorporated with, the broken material, the whole being of a consistency to be easily passed into the moulds, and to be pressed closely up to the sides and ends, and to embrace as it were the larger lumps put into the centre of the mould, and forming the packing, of which more presently. A little experience will soon enable the workmen to know the proper state of consistency in which the mass should be for using, care being taken to mix it well up before wheeling it off to be put into the moulds; for if not well mixed, the cement is apt to settle at the bottom, leaving the upper portion, of course, weaker than the lower.

From our description of the mode of using Portland cement concrete for the lining of silos in the pit or below ground-level system, the reader should be able to pick up as much information, with the additional sentence or two at the close of our remarks, as will be practically useful to him in the erection of simple farm structures, such as manure pits, or in silos on the above-ground-level system which, so far as the principle of construction is concerned is simply an enclosure within four walls, the plan being either rectangular, *i.e.*, longer than broad, or square—that is, equal-sided. Of such "above-ground silos" the floor should be made of concrete equally with that of the pit or below-ground-level silo.

Presuming, then, that the pit is to be excavated of such dimensions as may be required for the weight of silage or green-cut food to be preserved in it,

those dimensions must be measured so as to allow for the thickness of the concrete lining. In the above-ground silo, the retaining or enclosing wall having, in the "filling in" and the permanent weighting processes, to resist a pressure acting almost wholly outwards, must be thicker than the lining or inside walls of a silo on the pit or below-ground-level system; as in this last the pressure, although outward as in the case of the above-ground silo, is met or resisted by the solid soil or earth surrounding the lining walls against which they are placed. While the retaining or enclosing walls of the above-ground silo should not be less than nine inches, the lining walls of the pit silo may be very much thinner. Practically their duty is really to keep the water from the surrounding soil from percolating to the interior of the silo pit, and has little or no work to do in resisting the pressure put on the silage or green food preserved in it, the lining forming a part, so to say, of the soil, and merely acting as a waterproof or water-tight facing to it. If the best Portland cement were employed, we should have no hesitation in making the lining of concrete not exceeding two and a half inches. No doubt it may be said that there is a pressure exercised by the surrounding soil tending to force the lining inwards, but this is reduced to a minimum in heavy or clayey soils, and in lighter ones may be fully provided for by a thickness of five or six inches given to the lining walls. If the silo pit were made circular in section or plan—the strongest form of side to a pit—we should have no hesitation in lining it with a concrete facing not exceeding an inch and a half in thickness, always providing that in such fine work the very best materials were alone used, as sand and a good proportion of concrete.

Having, then, the pit for the below-ground-level silo dug out, the sides being squared down so as to be "plumb," or "plim," as pronounced by most workmen, and the bottom levelled and well rammed down, the placing of the concrete "floor" of the pit is the first work to be done. Having the mixing "board" we

have above described placed at a convenient spot near the pit, the materials have to be prepared of which the floor lining in conjunction with the cement is made. The floor is practically made up of two kinds of materials, first the foundation course, technically termed the "bottoming," and the concrete proper. This last rests upon and is partly incorporated with the bottoming, which has thus to be the first prepared and laid.

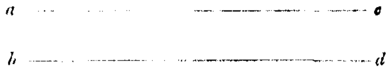
The following is a brief description of the mode of preparing the "bottoming" of stones for the concrete to rest upon. The best material to use is broken bricks, or small clinkers, or broken stones, or what are called "stone shivers," the harder the stone the better, such for example as road metal used in macadamising roads, which we have found excellently adapted for the purpose. The stones or small clinkers should be of a size sufficient to pass through a ring not exceeding two inches in diameter. Larger-sized stones do not "bed" or lie well together so as to form a level surface. The concrete proper has for its base fine breeze or ground brick, and if this cannot be obtained, good sharp sand, sea or river, will do admirably; we have used both with success. The bricks or sand are well mixed with Portland cement in the proportion of three parts of the material to one of the cement, water being added to bring the whole to such a consistency as to be easily spread upon the floor. Not much should be mixed at a time, as it sets rapidly. The spreading should be begun at one end of the space, and gradually laid down to the other end, so that what is done may not be trampled upon. Where parts must be passed over before the concrete is set, plank boards should be laid down, as a bearing surface. In forty-eight hours the surface will be quite hard enough to be walked over without injury, and in a week it will be as hard as stone, and will present the appearance of a floor of that material, solid, without a crack or flaw throughout its whole extent if well laid down.

As in some cases the green-cut food put into the silo

to be preserved may be so wet that under the pressure to which it is subjected water or juices may be expressed in quantity sufficient to form a thin film of liquid on the floor of the silo. Although this, being watertight, will not be injured by it, provision can easily be made for it so that it will be kept separate from the "silage" lying above. This can be done by forming channels or depressions in the face of the concrete lining; and this with the greatest ease by simply making use of a piece of wood a little less in length than the breadth or length of the floor of the silo, having its edge half round, or bead-like. By pressing this to a small depth into the concrete facing before it sets, a channel will be made on the floor surface. Any desired number of those channels can be made. The thoughtful reader will see how, by this plan, "open gutters" can be formed of any shape and taking any direction in the making of concrete floors to stables, cow-houses, piggeries, or the like. As will be shown presently, there should be no actual need of forming those channels in pit-silo floors, because if the ensilage be done properly there should be little actual liquid expressed from the green-cut food put into the pit.

We now come to the lining of the sides of the pit-silo, or what may be called the walls of the excavation. And what we have to say preliminary to the practical work to be done will apply specially to the construction of the walls required for an above-ground silo, or to any other class of farm building work required, such as manure-pits, piggeries, or the like. In the formation of a concrete floor, the original surface of the ground forms the supporting surface of the semi-liquid concrete and the bottoming, which together make the finished floor when the upper layer of concrete proper sets. And till this setting, indicating a hardening of the cement, takes place, the floor material must not be disturbed in any way. But even the reader who has not been accustomed to constructive work of any kind will have no difficulty in seeing that, forming a body

of concrete, no matter of what thickness, which, when finished, will be vertical, such as a wall, while the ground forms the supporting surface of the base or foundation of the wall or vertical mass, there is no supporting surface to the sides, so that the mass of concrete in its semi-liquid or loose condition will naturally fall away or down, and simply become a heap lying upon the ground. The concrete must, therefore, be supported, whatever be its mass, till the cement sets, and then it *becomes solid and stone-like.* If one has a mass of concrete to form, the height of which is much greater than its thickness, and which, like all walls, has two free or exposed surfaces, keeping its ends or extremities out of view at present, the mass must be supported on both sides till the cement is set. To use a familiar expression, which, in fact, explains the process of concrete wall building, the mass has to be "moulded." A mould, therefore, has to be made to suit the dimensions of the wall required to be constructed. The simplest form of a concrete wall-mould may be made thus. Let two flat boards of equal surface be fixed vertically and fairly in the ground, and kept separated from each other, say, a distance equal to *a b* or *c d*, as in the following diagram:—



Let the space formed within these two board-surfaces, *a c*, *b d*, be the concrete material place or mould. And as each portion is added, let it be levelled down, and the stones, clinkers, or broken bricks, or whatever form the base of the concrete may be made of, pretty well settled down by the hand or by a small rammer, and carry on the process of adding layer after layer within the space *a b*, *c d*, till the upper edges of the boards be reached; then allow the whole to remain at rest till the cement sets or hardens. When this takes place—which will depend upon the proportion and good quality of the Portland cement used, but

which may be averaged at from eighteen to twenty-four hours—if the boards be taken down, we shall then have a wall or structure equal in thickness to *a b* or *c d*, and in length to that of the boards *a c* or *b d*, and in height equal to the depth of the board, which we may suppose to be *e f* or *g h* in the following diagram—

in which *e g* or *f h* is equal to the length *a c* or *b d* in the first diagram. When the boards are taken down, the surfaces, *e f*, *h g*, will be found to be smooth, and of a dull grey colour. The smoothness will, of course, depend upon the way in which the concrete was filled into the moulds, the proper mode of doing which will be presently explained.

It will be obvious that while for the construction of free walls, that is, with the two surfaces or sides exposed as in all ordinary walls, the mould for the concrete must have two sides, as *a c* or *b d* in the first of the two diagrams we have just given, only one side is required for the lining or wall of the pit silo,* as the other side is formed naturally by the face of the excavated soil. Thus, if we take the line *a c* to represent the inside line or the inner face of the excavation, this forms, practically, one side of the mould, so that we have only to provide a board, or boarding, represented by the line *b d*, to form the other. If the pit of the silo is of the length of *e g*, and the breadth of *g h*, it is obvious that we shall require two boards, one to form the mould for the sides, *f h*, and the other for the end, *g h* or *e f*. The cheapest way, then, will be to make the pit or silo square; the sides being then equal, one boarding or inner side of mould will do for all.

As walls are generally of considerable height, to form the full height of the wall by one setting or fixing of the moulds would obviously be inconvenient, and in

the majority of walls for ordinary buildings impracticable. It is therefore usual to construct the walls by a succession of heights, or "courses," as the technical phrase is. The depth of the boarding forming the mould side is, therefore, made equal to one of these "courses" or rises, and this should be some multiple of the whole height of the wall. Thus, a depth of 1 foot 8 inches will give on six rises a height of wall equal to 10 feet, or with five rises or courses, 8 feet 4 inches. In the case of walls for above-ground silos, the height will be determined by the convenience of working, and the cost of the moulding appliances, presently to be described, for building a high wall is greater than the appliances required for a wall of such moderate height as could be constructed with a mould made in one depth or piece, and boarding five or six feet deep would be easily enough made and used. This moderately high wall would in most cases be quite sufficient, and the entire cubical space or contents of the silo could be made up by increasing the area, that is, the length and breadth of the silo. Land-surface in rural districts is not so costly as in towns, where building land has a much higher value.

No doubt the extension of area or surface of the silo affects the expense of getting the required permanent pressure; but we shall see hereafter, as we proceed, that this cost may in nearly all rural districts be reduced to a minimum. In the case of pit silos, we should strongly recommend the excavation or pit to be of moderate depth, and the cubical contents or capacity to be made up by increasing the area or surface. And for this reason, that as the depth of the pit increases, so do the cost of excavation and the time taken in doing the work, and that in a quickly increasing ratio. But difficulties in the excavation, especially in certain soils, frequently arise, which demand an engineering knowledge of a higher class than the ordinary kind of farm-labourer possesses, and which will not usually be met with. When the excavation is of moderate depth—say from four to six feet—the mould-boarding required

can easily be made in one piece or depth of planks edge to edge, and secured together by battens at the back. Where the sides of the pit silo are of considerable length, the length of the mould should be some multiple of the length of the silo side, so that two, three, or more changes of the mould will give the length required. A convenient length for a depth such as named above would be eight or ten feet. The length of the mould for above-ground silos may be greater than this, as the depth should or may be less, say twenty inches. The method of using the one-mould boarding required to form one side or lining-wall to the pit silo will be a simple modification of the method of using the mould for the construction of ordinary walls of above-ground silos, manure-pits, piggeries, or the like. And of this, as well as of the method of constructing the mould itself, we now proceed to give a description.

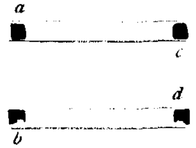
First, as to the mould, or rather, the boarding which, worked in pairs—the "inside" and the "outside" boarding—form the mould. The boarding is made up of planks eight or ten inches wide and five-eighths or three-quarters inch thick. The shorter the length the thinner the boarding required. If moulds ten feet long are used—a very convenient length for boarding—half-inch, or better three-quarter inch boards would do, with careful filling in of the concrete; that is, avoiding all hand-ramming in of the materials. There is no necessity to ram or strongly press down the packing (see a succeeding paragraph); all that is necessary is to place them with some care, so that the stones, broken bricks, &c., constituting the packing lie pretty closely to each other and slightly pressed down by hand. The thinnish stuff or cement running in between the interstices of the packing stones, and between them and the sides of the mould, binds the whole together. If, on the contrary, ramming down the materials forcibly be resorted to, it will have the effect of forcing out the sides of the mould, causing them to "belly," as the technical term is, and creating inequalities in the face of the wall,

and causing openings to be formed through which, at the lower edge of the mould, the thinnish cement is apt to pass. This "bellying" can only be prevented by having the boards of which the mould is made very thick and strong. But by avoiding ramming or undue pressure—giving to the packing-stones only the small hand pressure we advise—the boards may merely be thick enough to give the mould the strength necessary to sustain the weight of the materials and prevent them from spreading laterally till the cement is set. This is in reality the only office the mould has to perform, and by its form to give the wall a uniform thickness throughout. So simple, indeed, is the method of constructing walls in concrete, so tractable, so to say, the materials, that we would undertake to raise any length of wall with the aid of two flat planks, ten to twelve inches wide and some twenty inches long, and four stout stakes. The process would be a slow one, no doubt; and it is to make it a more quickly-finished process that a long mould is used.

The mould, then, is constructed of two boardings and made as follows. The planks, as already stated, are eight or ten inches wide by five-eighths or so thick. Strengthening pieces, or battens, four inches by two inches, are secured to the outside of the boarding, the boards forming the inside of the mould. The side boards are kept together when placed in position on the wall by wrought-iron bolts, which pass through side battens or strengthening pieces, and are secured by the nuts at one side. The distance between the centre of the lower bolt and that of the upper, or course, is exactly the height of each successive rise, as the moulds are shifted upwards—that is, the wall is built up in portions corresponding to this height; eighteen or twenty inches will be an easily worked height for the "course." We shall hereafter show how, for a silo of the simplest kind, moulds may be made of less complex character than that just described. The distance horizontally between the bolts is four feet, the bolts have a taper given to them in their length of from five-

eighths to three-quarters of an inch. We now come to the fitting-up of the apparatus and the mode of working it in the building of the walls. The first thing to be done is to stake off upon the site the accurate dimensions of the proposed building, taking care to have the walls exactly at right angles to the sides. At one corner two posts are placed, and, if the wall is to be nine inches thick, exactly in such a position that when the moulds are put up, the distance between the interior faces of them shall be exactly nine inches. This thickness for a silo wall of moderate height above the ground level will be quite sufficient. And if this silo be made so as to be a semi-pit—*i.e.*, one whose space is half in and half out of the ground—the height of the wall above ground-level need not be more than one side or course of the mould; that is, if the depth or height of the mould be twenty or twenty-four inches, one fixing of the mould will give the height required. This form of "semi-pit" silo, will be found the easiest to be constructed if the whole work—concrete constructing and digging—be done by the ordinary labour of the farm.

The position of the posts at the starting of the wall at one of the courses is shown in the annexed diagram.



Let A B represent the posts; the distance, such as that from D to C, and from A to B, being nine inches, or whatever the thickness of wall is to be. Two additional posts are placed at points C and D—the distance between these points and those at which the posts A and B are fixed being equal to the length of the mould, a boarding eight or ten feet, as the case may be, as shown in the diagram above.

On the supposition that the amateur farmer intends to amuse himself by raising constructions other than silos, and these structures being, say, cow-houses,

manure-pits, sheds, piggeries, or the like, or even cottages, the posts provided should be strong enough and long enough to compass all classes of work. Posts four inches square in section will be quite strong enough, as the pressure in them is almost wholly vertical. Indeed, if strength only were considered, a three-inch section would suffice; but a side surface of some width is convenient for working, hence the greater section we have named. We would scarcely recommend the amateur farmer to attempt two-storied structures, as in the case of cottages for his labourers; the length of the posts for a single-storied structure would be twelve feet. This would give a height of nine feet in the clear for the wall, allowing ample length for insertion in the ground and also a surplus at the upper termination above the moulds. If the mould were under twenty-seven inches deep, the wall would be raised in four lifts of the mould or courses.

Where only one semi-pit silo is intended to be made of concrete, or where an above-ground silo was preferred, but with a wall of moderate height, say two courses of a twenty-seven inch mould, posts such as we have described may be dispensed with and good strong ordinary fence stakes substituted. We have recommended a semi-pit silo to be made rather than one wholly above ground, as the wall, being required in this case to be only of moderate height, the depth of the mould may be such as to give the full height of the wall with only one fixing. The mould may thus be made three feet deep, of nine, four-inch planks, secured together by battens as already described. But the wrought-iron bolts may be dispensed with, as these are only required for a high wall where the mould has to be used in a succession of lifts, rises, or courses. And when there is only one silo to be made, the simpler the apparatus for wall-raising the better. Stakes being fixed in the soil perfectly plumb or vertical, in the position shown in the last given diagram, the moulds may be secured by simply nailing them to the stakes. This should be done carefully, to avoid unnecessary wasting of the boards or planks, which after

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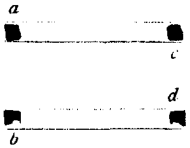

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the silo concrete wall is raised may be used for other work. If the side walls of the silo are of considerable length, necessitating several lengths of the mould to make up the distance, the stakes for positions intermediate between the courses are placed as shown in the following diagram; the stake—or post, where posts are

used—*a* being in advance of the stake or post *c* as the post *b* at the starting corner is obviously in advance of the post *d*; the relative positions of the posts are thus maintained, so that when the corner at the other end of the wall, of which *b d* is the beginning, is reached, the posts will be in the proper position corresponding to that shown in the diagram on page 260.

Where high walls are required, which for an aboveground silo, or for another class of farm structure is required, mould and post apparatus of a more complicated character are required than that for simple work where the height of the wall is made in one fixing of the mould. The mould itself, or rather the two boardings forming it, is provided with wrought-iron bolts, as already described; and as they cannot be secured to the posts by nailing, as in the simple work last explained, another and more perfect method must be adopted. The simplest way to effect the junction between the moulds and the post is that illustrated in the drawing, Fig. 44. Let *a a* in this represent part of the upper edge of the strengthening piece or longitudinal batten binding the planks *b b* of the

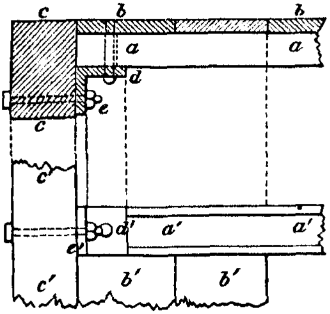

Fig. 44.

mould together, and let *c c* be the cross section of the post. A wrought-iron clip of one-fourth or three-sixteenths plate, having two sides, *d e*, at right angles to each other, is secured permanently to the batten, *a a*, by two or four screw nails, as shown in front elevation at *d'*. The other face *e e'* is provided with a half-inch hole, through which a bolt passes, and also through the post *c c c' c'*, and the two, namely, the clips *e d* and post *c*, joined and kept fast together by a screw-nut. Both top and bottom battens *a a* are thus provided with clips *a e*, so that the moulds are secured at both top and bottom to the posts *c c*. A series of holes should be bored in the posts, and the distances between these are obviously equal to the distance or height of rise in the mould at each course taken in raising the wall. When the posts are finally adjusted, the moulds rise perfectly horizontal in the direction of their length, and perfectly plumb in the direction of their depth, and the posts being perfectly plumb at starting, these positions will not be altered throughout the whole work, and no other adjustment will be required. The battens *a a* are of course outside, the boards *b b* being to the inside of wall.

The packing or central portion of the wall, of larger pieces of brick or other material, is now to be put in, keeping this as exactly in the centre as possible, so that *a clear space is left on each side between the outside of the packing and the inside face of the mould.* The well-mixed concrete is then brought up from the mixing-board and poured into the mould, so that it must lie between the interstices of the packing and fill the *side spaces between it and the inside of the mould.* The whole of the mould should be filled thus, and the cement allowed to set. In the case of a long silo or other wall, the mould may be of considerable length, so that the filling may be done one day and the setting completed by the time work is begun on the day following, or two sets of moulds may be used. In the case of a room or cottage, the moulds should embrace the whole of the walls all round, so that they may be

filled in the early part of one day, giving the whole time from the filling of the moulds to the beginning of next day, when the whole will be found well set and compacted together. On the supposition that a high wall is to be raised, on the first course being completed, the mould has to be screwed higher up the posts, so that the course next in succession can be formed in concrete. This is done by unscrewing the nuts of the bolts of the clips *d d*, Fig. 44, and of the bolts *e* of the moulds. The batten bolts *d e* are then knocked by a hammer at the small end until they are forced out of the concrete wall, in which they of course leave holes all along the length at distances of four feet from each other, which holes are finally filled up with cement. The moulds are then lifted up, and the upper range of holes left by the bolts of the moulds in the wall form the holes through which the lower bolts now pass and secure the moulds to the wall. The clips are then fastened to the posts by the bolts, and the moulds are now in place for the second rise of wall being built. The moulds are then filled as before, and allowed to remain at rest a day for the materials to set.

We have thus explained the mode of building, so far only as plain or solid walls without windows or door-openings are concerned; but the mode of making these openings is extremely simple. If simple openings only are required, with no framework fixed in same, then all that is necessary is to put in what may be called "stops," or rough boards of timber at the points in the mould corresponding to the points at which the opening is required. Thus, in Fig. 45, let *a b b* be the sides of the mould, and *c d* the sides of the opening *g* to be made, then at these points boards *c d* are fixed between the moulds, care being taken to keep them perfectly plumb till secured. The length of these side pieces is

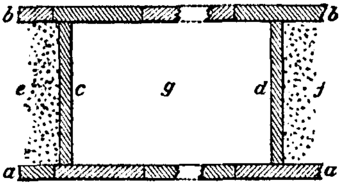

Fig. 45.

obviously equal to the *height* of the opening required. The concrete is then filled in at the spaces *e f* at each side of *c d*, thus leaving the space between them vacant, as at *g*, and when the desired height is reached and the moulds are removed, the boards *c d* are taken out, leaving the sides of the opening quite flush and fair. If the opening be in a low wall—for example, the front wall of a piggery—nothing more is required; but if it be a door-opening in a high wall, with solid wall above the opening, then, when the mould is fixed at the rise corresponding to the height of the door, a horizontal board *a* is fixed across the two side boards *c b*, Fig. 46, and the concrete filled in above this at *d*.

The diagram *abcd*, in Fig. 46, may represent a square aperture, as the feeding-hole in the side wall of a cattle-

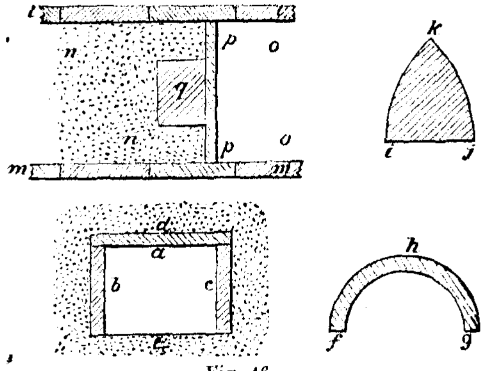

Fig. 46.

shed or piggery, the bottom part *e* being formed by the upper face of concrete course last completed. If it be desired to have the upper part of the opening semicircular, or like a Gothic arch, as in the case of a door or window opening, all that is required is to substitute a board shaped as *f g h*, or *i j k* for the flat board *a* in Fig. 46. The reader should, from these illustrations, have no difficulty in making openings of any kind and

of any desired form or dimensions; all that is necessary to be done is to provide boards to form the "stops," and place them in the proper position. For buildings other than silos, where regular door and window openings are required, and wood bricks required at sides of openings to which the door or window frame is to be nailed, they are put in the concrete wall in a very easy and simple way, illustrated in Fig. 46, in which *l l*, *m m* represent the sides of the mould, *n n* the solid concrete wall, *p* the "stop" corresponding to *c d*, and *o* the vacant space of the window or door opening or "void." The wood brick is shown in section at *q*, and should be at least six inches on the side or face next *o*, to give plenty of nailing space for the framing to be fixed to it. It may be of any depth or height, and if required may extend from top to bottom of the opening in wall. Three wood bricks, as *q*, will do for ordinary work, one at the centre and one at each extremity of the under face of opening, which face is termed a "reveal" in the case of a window, a "jamb" in that of a door, opening. The diagram at *l l*, *m m*, *o* shows only one side of the opening, the other being the same, but in this the wood brick *q* lies to the right of the "stop" corresponding to *p*.

Roofs are in all cases required for "silos," but where the breadth of the "silo" is narrow, and the span of roof correspondingly small, it may be made so light as to be easily removed, simply resting upon the top of the side walls. In most cases it will be better to rest the roof on a "wall-plate" of wood running along the whole length of the side walls. The wall-plate, which, for ordinary width, may be 6 inches deep by 2 to 2½ inches broad or thick, should be let into the wall, that is bedded in or surrounded by the concrete, at its lowest part three inches deep. This is illustrated in Fig. 47, in which *a a*, *b b* represent the sides of the mould, *c c* the concrete filling, and *d* the wall-plate.

Thoroughly waterproof roofs may be made of a light framework of wood covered by the "New Willesden waterproof paper," which we can well recommend.

This will be so light that it may either be lifted entirely off, or, which will be better, may be moved or slid along, exposing only that part of the silo below from which the produce is to be taken out for stock-feeding purposes. The lower rib which supports the small rafters of the roof or sliding frame should have nailed to its under side a projecting piece rounded on the lower edge. This half-rounded part is that on which the roof slides, and it runs in a groove as *e*, made in the top surface of the wall, one side sloping outwards and downwards to carry off any water which may collect on the top, or this part may be covered by the roof or sliding cover being made to project some few inches

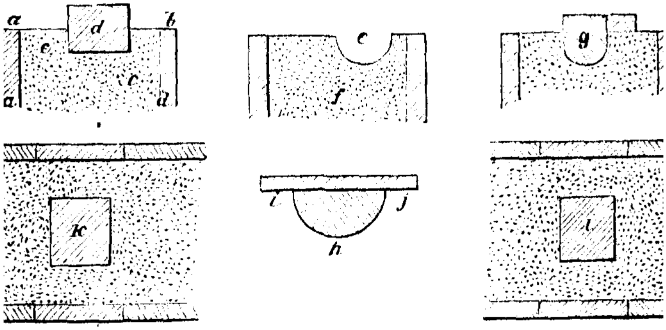

Fig. 47.

beyond the outside line of wall. The manner of forming the groove and slope in one is shown in Fig. 47, *g* being a block of wood of any length convenient to work, the lower side being sloped so as to give the groove and slope, or the simple groove only. This block is to be bedded on the top surface of wall, after it has been finished with a layer of the thinnish concrete; it is to be then worked sideways to and fro to consolidate the concrete and give a smooth surface to the inside of groove. The block may be allowed to remain for an hour or two to permit the cement to partially set; but it should be occasionally rubbed or moved to and fro in its bed to prevent it adhering to the cement.

When taking out, the top should be covered by loose boarding to prevent the concrete being broken or disturbed till the top is quite set.

It may be as well to draw the attention of the reader to the fact that this method is the same as that applied to the formation of open or surface "gutters," the floor of stables, cow-houses, and the like, which are made of concrete. The gutter-forming mould may be made simply as at *g*, but in order to give uniformity to the depth of the gutter the mode illustrated at *h i j* on preceding page will be best. Here the piece *h* is what gives the form or depression of the channel or gutter in the concrete; this nailed to the centre on each side of a broad piece *i j*, shoulders as at *i* and *j* will then be formed, which will rest and slide upon the general surface of the floor, and thus insure the depressions formed being uniform in depth throughout their length. A very little practice will enable this as well as all other concrete-working appliances to be easily and uniformly effected. The illustration in Fig. 47 shows also how easily ventilating channels or tubes, or chimney or stove flues, are formed on the inside of concrete walls. All that is necessary is to have a wood block made of any size and slope desired, such as shown at *k*. This block is built as the wall is filled up in the mould, but is worked up and down by a handle or large nail driven into the upper end so as to prevent its adhering to the cement. The block is, of course, withdrawn when the wall is finished in that course, leaving an aperture in it as at *l*. For a circular ventilating channel a drain tube will do admirably as the block, corresponding to *k*, and the socket part of the upper end will serve as a means of withdrawing the tube. It is scarcely necessary to say that in order to have the interior surfaces of such ventilating channels smooth, no packing stones should be placed near the blocks as they are formed. The blocks should be surrounded with thinnish cement concrete. The same remark applies to the layers of concrete in which the gutter-forming blocks, as *g* and *h*, are used.

CHAPTER XXI.

THE FILLING-IN OR PACKING OF THE SILO WITH THE GREEN-CUT PRODUCE.

We now come to the filling in of the silo, or rather, to use the better term, the "packing" of it with the produce to be preserved, this term involving pressure in so far that the greatest amount, or weight, of produce is to be got into the smallest cubical space. Taking meadow grass or any of the artificial grasses, such as Italian rye-grass, as the typical ensilage crop—that is, the produce best fitted for that system of preservation—it takes but little observation to perceive that to pack a certain bulk of it into the smallest possible space will require proper management in the operation. It would in practice be found that with grass thrown in any way, a certain cubic space would be required for it under a given amount of pressure; but by placing it carefully by hand, so that the thick parts of one heap or armful shall lie on the thin parts of a previously deposited heap, a less amount of space would be required to hold it even with the same pressure. Any one having experience in packing knows well that the saving of space is dependent upon the way in which the materials are disposed or placed in relation to each other. Now this relative economy of space, or what is the same thing, the closeness with which the material will lie together, is aided in the case of grass by cutting it into short lengths—"chopping" it, to use the common term. And this is simply because the mass, as a whole, is equalised, the mere multiplicity of its component parts tending itself to their ready adjustment, so that thick parts will be superimposed upon thinner parts; and hollow places being thus filled up, the uniformity

of surface so essential to the successful packing of produce is obtained. Hence in all good systems of ensilage the cutting of the produce into short lengths is an important feature. As this costs money and takes time, many think that both will be saved by ordinary cutting or chopping, and simply packing the grass as it comes from the field. But, if anything is worth doing at all, it is worth doing as well as it can be done, is a maxim which cannot be ignored without loss. And it is especially true of the process or work of ensilage. And it is just because it is always best to understand the reason why a thing is done which is recommended that we have gone somewhat into the *rationale* of packing.

No doubt the condition necessary to secure good packing of the crops "ensiloed"—to coin a word for the occasion—will depend greatly not only on the kind of crop used, but the state of growth of any one crop. Thus grass cut in a young or highly succulent condition will be much more easily packed closely together than if at a riper stage, when its stems are larger and much harder; and grass will, for example, lend itself, as a rule, better to close packing than will green-cut oats with the ears or grain blossom formed, however soft or "milly" they may be. The mere mechanical condition of the crop must be always taken into consideration in deciding the relative packing value of silage crops; and all the crops suitable for the process will be packed more efficiently if cut into short lengths, or chopped.

This cutting will of course be done by the chaff or ordinary straw cutter, worked by hand in the case of a small farm, but for large silos steam power is indispensable. Lengths of three-fourths of an inch are about the average "cut," but this, again, will be modified by the crops used, and also by their condition. Harder or larger stemmed crops—such as green "maize" or Indian-corn, simply termed "corn" throughout the United States and North America—will require to be cut into much shorter lengths than soft or small-stemmed

crops. But in this department of practical farming, as in all other departments, there can be no hard-and-fast rule given; circumstances will decide the details, and the success of the process will depend very much indeed upon the way in which those details are patiently thought out, and the process and principles of the system investigated. The reader may rest assured that a thoughtful, observant way of dealing affects the success of more farm processes than ensilage, and lies at the root of all well-conducted and skilful farming.

But it is obvious that one may have his materials ready for packing in a very good way, nay, in the best condition to secure the end desired, and yet that end may not be attained unless the packing itself in the silo be carefully devised and as carefully carried out. We meet with an analogous case in the building or engineering process known as the "puddling" of foundation courses, or of the central space of a dam or embankment for a reservoir. The "puddling" is neither more nor less than "clay," and the more plastic and cohesive, and the freer from small stones, gravel, and organic matter—such as woody fibre, rootlets of plants, &c.—the better. The process of puddling—that is, the practical use of the material—may be properly carried out, but if the clay itself is defective it will be but puddling in name. A "puddled," so-called, foundation or embankment may look as if it were well done on merely examining the surface, yet it may be altogether deceptive, and the deception may be, and often has been, the cause of grave disasters. Now, as there is puddling *and* puddling, so, in the filling of the silo, there is packing *and* packing. Granting that the clay to be used for puddling is in good condition, the proper use of it is to keep adding to the thickness or depth of the puddled mass by a succession of *thin* layers evenly distributed, and then carefully and uniformly "puddled"—that is, beaten or hammered down. And the great object is to arrive at the minimum thickness, not to aim, as so many careless workers do, at seeing how thick the layer *can* be worked, and how

soon the foundation may be made or the dam centre filled. The perfect union required between the upper face of the layer last finished and the lower face of the layer being added, can only be secured by leaving the upper layer at the minimum thickness which admits of the force of the blow or ram communicating itself to the two surfaces to be made, as it were, one. If the layer be too thick or deep, much of the force of the blow is absorbed or taken up by the mass of the clay which acts in this way as a cushion, deadening the blow at the very point where its force is chiefly wanted—that is, where the two faces meet. The silage or crop to be preserved in the silo differs from the clay used in puddling in that it is largely elastic, the clay being, practically, inelastic.

It is this difference which introduces a feature peculiar to the packing of the produce preserved in the silo. In the case of puddling, where the margin of the puddled surface must be carefully attended to, to make a good union or joint at the lines where the clay comes up to the faces of the retaining or containing walls, the whole surface, every inch of it, must be carefully and equally rammed down. But in the silo the chief attention must be given to the margins—that is, the sides and ends of the silo—for it is there where any air and moisture present will force itself to the mass, if it will anywhere. And if the packing also be carefully done, and the produce pressed or rammed down equally at the sides, the elasticity of the mass will aid the packing closely together of its centre, at which point there is the least chance of air gaining admission to the whole mass or to parts of it.

What we have said, then, urges that the produce be put into the silo in thin layers, the minimum thickness being discovered by careful observation; these layers should be as evenly distributed or levelled as possible, and the pressure or ramming down, while given uniformly all over the surface, should be especially attended to and secured at the margins or outer edges of each layer, where it comes

in contact with the sides and ends or interior wall surface of the silo. We have no belief in hurrying over or "scamping" work, the main object in this being to get it quickly done. This applies to all classes of work, especially that of ensilage. If this is to be done well it will only be done slowly, that is, the maximum of time required to secure perfect packing must be given. Where ensilage has not been successful its principle has been condemned, whereas that which ought to have been censured as the cause of the failure was defective work, hastily and carelessly—or both—carried out.

To give one, therefore, every chance of being successful in the ensilage process, the packing or filling must be done with the greatest care. And time given to secure its being done as well as it can be done must not be looked upon as being wasted or lost. The great point to aim at is not so much as to how it is to be done, but that it be done well. The "how" no doubt is of great importance, but the exact character of this will depend very much upon the circumstances of the farmer, and the character of the produce in the ensilage.

CHAPTER XXII.

THE "LOAD" OR PERMANENT PRESSURE TO BE PUT ON THE FILLED OR PACKED SILO.

We have said that the silage or produce to be preserved is, to a certain extent, elastic, and on this peculiarity rests one of the most important features of ensilage, namely, the permanent pressure to be put upon the packed mass. How powerful this elasticity is in the silage may be tested by a simple experiment and by aid of very simple apparatus. This may be carried out in more ways than one. But if means are taken to gauge a mass of highly compressed—that is, thoroughly well packed—produce immediately or very shortly after the packing has been completed, and to gauge the same some hours after the mass is allowed to remain at rest from the pressure put upon it, it will surprise many to see how greatly the thickness or depth of the mass has increased. In other words, the separate fibres have more or less parted from each other, and having sprung up have affected the whole mass, rendering it looser than before. This would seem to be antagonistic to what we have said when treating of the packing or filling up of the silo as to the practice of filling it up gradually, so much a day being filled up so that the mass would settle and consolidate. But there is in reality nothing antagonistic between the statements. There is a certain amount of natural settlement or consolidation as the result of each packed layer being allowed to rest a certain number of hours before the succeeding layer is put in. But the consolidation here noted is only temporary, and is at its best only partial in its effects,

and not sufficient to neutralise effectually the natural elasticity of the mass to which we have just alluded. Moreover, after the silage has been a certain time in the silo, certain changes in its composition begin to take place, which, aiding this elasticity, bring about a looseness or openness throughout the mass which is directly and powerfully antagonistic to the very principle upon which perfect ensilage depends. That principle has been already referred to, and its exposition may be here given in a single sentence, and that is, that it is the exclusion of the air as completely as possible from the mass of produce in the silo.

This essential may, up to a certain stage and up to a certain point of efficiency, be secured by the primary careful packing we have described. But from the very nature of the silage, and from the conditions under which it is placed while remaining for a length of time in the silo, this primary exclusion of the air is not maintained, and can only be so by not merely keeping up the pressure at first obtained by the packing, but by largely adding to it. This is effected by the "permanent pressure," or, as we prefer simply to term it, the "loading" of the silo. This "load," to use the term in its engineering or mechanical sense, put upon the silo may be obtained in different ways—such as by heavy weights of iron, stone, brick, or concrete, slabs, common soil, sand, or gravel. These may be termed natural loads, or as giving natural pressure, as distinguished from the more costly and specially applied system which may be called mechanical, and in which the screw and the lever, as mechanical agents, play an important part. For the small and amateur farmer the first-named of these two methods of loading the silo, namely, the natural one, is the best; and the cheapest and the most readily had of the materials comprised in it are what Mr. Jenkins calls "local materials"—that is, soil, sand, or gravel. Whatever be the material used, the great object to be gained is what engineers call an "equal distribution of the load." This demands a uniform spreading of the soil—or other material

employed—over the upper surface of the silage. If soil be used, this uniform distribution is not so easy in all cases or qualities of soil to be obtained, as one might suppose at first sight. It is obvious that the more uniform or homogeneous in character the soil itself is, the more easily will it be spread out, so to say, and the more uniform will its pressure or weight be on the surface on which it lies. The more lumpy the soil is, therefore, the more difficult will it be to get its weight uniformly distributed; the more friable, the more easily will this be secured, for its particles will, so to say, have a tendency to spread themselves out, running away as it were, from each other. It is this quality which makes sand so highly valuable in constructive work where any pressure is to be uniformly distributed, and where the sand is firmly retained within the enclosing space makes it also valuable in resisting pressure put upon it. Hence sand is poured into holes, and inserted in some cases in place of timber piles, in making foundations for masonry, as it gives such a uniformity of resisting power to pressure or loads put upon it.

But sand, while it can be uniformly spread on the top, and thus give to the silage a pressure more perfectly uniform than ordinary soil, has this disadvantage, that it finds its way through very small crevices, and therefore is exceedingly apt to get mixed up more or less with the produce of the silo. To overcome this objection to sand when used in bulk, that is, simply spread over the surface of the silo, it will be a good plan to put the sand in coarse but sound bags. These can be distributed so as to give as uniform a pressure as possible over the whole surface. A still better plan for securing this uniformity of pressure will be to have a series of narrow wooden boxes which, when placed in position, will exactly fill up the surface of the silo from end to end. These boxes can be placed in position when empty, and then filled with the sand, which will give a uniform pressure over the surface of each box. This plan will also be a good one when light soil or small gravel is used to give the dead weight or pressure

required. One great advantage this plan possesses is that it will be a clean and orderly method of using such substances. And this is a great point in the well doing of the work. So valuable is it that even if heavy plastic clay be used to give the dead weight, although it would not "run" like sand or light soil or gravel, yet in order to secure the clean orderly condition we should like to see exemplified in all the work of the ordinary farm, we should use the wooden boxes, packing the clay carefully into them. When the time came to open the silo these boxes could be emptied quickly by hand or shovel and then be easily removed in order to get out the silage, this being taken out as explained below.

Whatever the material used to give the dead weight or load upon the silage; it is not placed immediately upon the surface of the last layer packed in, but a flooring of plank always intervenes between the silo and the material for the load. The silage is taken out of the silo for feeding purposes at one end only, so as to expose as little of the surface of the produce as possible. This is cut down vertically exactly as we cut down the hay in a haystack. The strip of produce in the silo exposed to be thus cut down and taken away should be as narrow as can be conveniently adopted for the quantity of silage required to be taken out. The reader will, therefore, see the necessity there is to make the above-named boxes narrow, if used, and also the value of the other recommendation that the width of the boxes should have a distinct relation to the width of the planks which, covering the silage, forms the floor on which the boxes rest. For if made of a width greater or less than the width of a given number of planks, there will be a difficulty in working the taking-out of the silage. But if the boxes be made so as to be equal to, say, two, three, or four planks, and the planks are all cut of a uniform width, when they are removed the right number of planks can be removed without disturbing the plank next in succession, the edge of which will be flush with the side of the box. This, along with the details we have given, may be

looked upon as a trifle, but it is attention to such trifles which makes a system easily, orderly, and therefore economically worked, each detail or part dovetailing as it were into another part, thus forming a well-arranged whole. Where a system is made up of many details, as the ensilage system is, this plan of making all dimensions multiples of a given datum division is of immense service in practically working it out. There is, moreover, a good reflex influence exercised upon the minds of all engaged when feeling that they are systematically helped in their work.

The dead weight or load of a silo is also obtained by the use of blocks of cast iron, or of concrete, and in some cases bricks are also used; and these satisfy the condition of systematic laying, as they are all "repeats" of one definite size. So, also, in the case of cast-iron or concrete blocks; they should be made multiples of the common datum divisions of the silo structure. In cases where a perfect system is aimed at irrespective of considerations of economy, the pressure can be put and kept upon the silo by special mechanical appliances. It is obvious that this system is not applicable to the circumstances of the small farmer, though it may suit those of the amateur. He has often a well-filled purse, and does not object to getting rid of a part of its contents if only he gets a "complete" thing, quieting all such economical qualms as might arise in his mind by the reflection—"I like to have the very best I can get; I wish my little farm to be a model one in all its departments." To those, however, who live to farm and farm to live, the cost of a system is the crucial point they have to consider; and it must not be disguised that the weak or rather the difficult point in the ensilage system to get over is just this point of the permanent pressure or load to be put and kept upon the packed silage. And so far as the small farmer is concerned we cordially endorse the opinion of Mr. Jenkins who, as we have stated, has seen more of ensilage as carried out practically than any other agricultural authority. And his opinion on this point of the load is thus expressed:

"The only economical method I know of, is the use of what may be collectively termed 'local materials.'" What these are is indicated on a preceding page.

As to the extent or amount of the permanent pressure or load required, in practice it has in this country varied from 1½ to 2 cwt. to as low as ½ cwt. per square foot of surface; of these weights Mr. Jenkins says, that while the first-named gives too great, the last-named gives

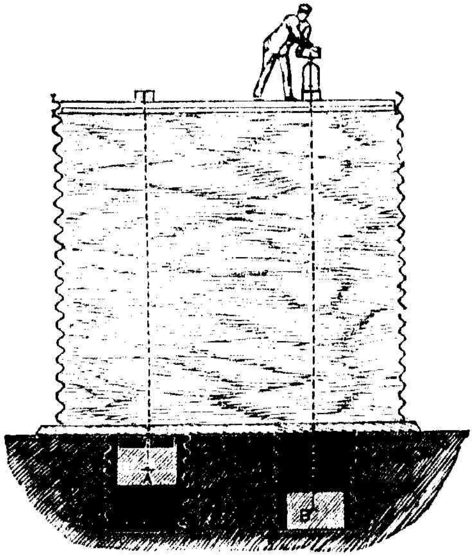

Fig. 48.

too light a pressure, and recommends a weight midway between these two extremes, namely that of 1 cwt. to the square foot of surface of silo. This will be given by a layer of ordinary or average soil 12 inches in depth, this of course resting upon the floor of planks covering the last packed in layer of produce.

The pressure or load may be put upon the silo surface by hanging or suspended weights. One method of doing this is shown in the above drawing, Fig. 48,

which also illustrates in section the form of above-ground silo, as patented by Messrs. Pearson, of Wolverhampton. The peculiarity of this silo is that it is quite independent of any fixed or permanent foundations, and can therefore be erected at any convenient place, and can be taken to pieces when emptied, and the pieces used for temporary roofing purposes, as cattle sheds or the like.

This silo is made with plates of galvanised iron, so curved that when bolted together they form a circular receptacle of any required diameter, from 8 feet up to 20; and, being made on the multiple system, the height can be increased as desired—and the deeper the silo the better the silage. From a constructive point of view, this arrangement of silo is altogether well designed, for the plates being circular, and each plate itself corrugated with circular corrugations or channels, we have such a constructive strength in the directions in which strength is required that the silo on this principle will bear any pressure put upon it, and no framing of any kind is required; and the whole is put together with such ease that any labourer, however unused to constructive work, can erect the structure in a very short time. Erected, moreover, on the surface of the ground, there is no fear of danger from drainage water. The only point to be attended to is that it should be erected with a north exposure and in a shaded place. We have said that no foundation is required; this is true in the ordinary sense of the term, but it is not precisely so in another sense. Still the foundation, so to call it, which this form of silo requires is very simple, being merely the selection of a firm surface of ground, and the digging within the circle of its base pits some three feet deep and the same in diameter. These, as shown in the section, are designed to contain the weights, which, when suspended, give the load a permanent pressure. The covering of the silo is made up of boards, and these are made so as to form sections or compartments; one compartment may be taken off without disturbing the others, and each compartment has also its own set of weights. When a compart-

ment is to be used, the weights are lowered till they rest on the bottom of the pit, and the pressure being thus taken off the boards, they can be removed. The drawing in Fig. 48 shows the method of weighting or loading the silo. There are some very good points con-

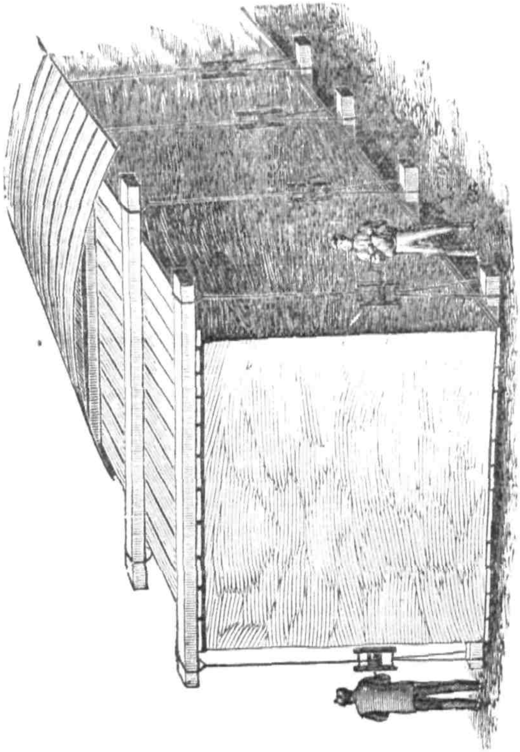

Fig. 49.

nected with this kind of silo. The method of applying the load is economically good in principle, as there is no lifting or removing the weights, and no silo space is taken up by them, so that the whole of the space can be used for packing the silage. Again, the system of

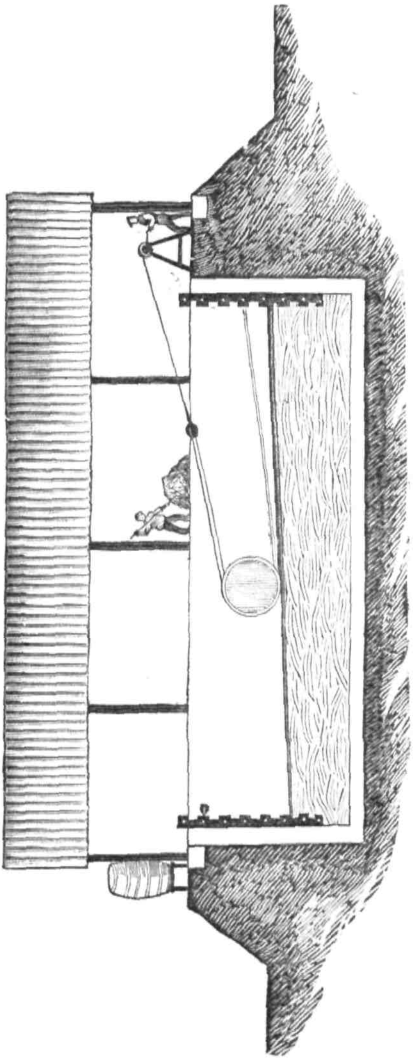

Fig. 50.

loading or weighting being always available and easier, it lends itself very economically to the method of filling the silo at intervals as the cut produce is ready.

Fig. 49 illustrates another method introduced by the Messrs. Pearson, who have given their special attention to the designing and construction of the mechanical arrangements of the silo; by which the more perfect and economical making of the silage is secured. The method of obtaining the pressure will be obvious on inspecting the engraving. This plan was, however, preceded by one which

presented quite a novel feature in what may be called the mechanism of ensilage. This was the combination of the most simple yet effectual mode of obtaining an easy movement; that is, by the use of the circular motion of a roller, and obtaining with the regular and uniform pressure it gives over any surface on which it is rolled, the requisite dead weight necessary for ensilage by simply making the roller hollow, and filling it with water or with sand. Fig. 50 illustrates the simple mechanical way in which the roller was worked to and fro over the silo planked surface. This has now been superseded by the highly simple system in which mechanism is conspicuous by its absence, boy or man power being employed, as shown in Fig. 51, in merely moving the

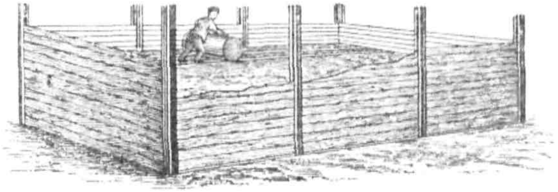

Fig. 51.

roller to and fro over the surface of the planks which cover the silage, and distributing on it the pressure uniformly. The following is Messrs. Pearsons' description of this, their last improvement in silage mechanism, of which it may be said that it will be a difficult task to improve *it*, in the direction of making it more simple or effectual. And simplicity is the great point to be aimed at in all farming operations. *Construction.*—Roller is hollow, made of plate steel, closed at ends, provided with screw plug for filling; is ballasted with the almost costless weight of water or sand (the latter, if easily obtained, gives nearly double the weight of water). *Working of Roller.*—Simultaneous rolling of one-half of silo and filling of other half should be followed. One half of silo is filled with loose grass, 12

inches deep, the boards laid down—the roller covers seven boards which are 9 inches broad by 1½ inches thick, and the length of board depends on width of silo. Two boys, or even two girls, as Mr. Hudson says, of fourteen years, may move roller easily to and fro. The 12 inches of grass will be pressed into a compact body of about 2½ to 3 inches deep. No haulage gearing is used, merely rolling by hand as shown in Fig. 51, and when top of silo is reached the grass is one solid mass by thus pressing in layers. 2 to 2½ feet of ensilage is fully pressed per day in silo 34 feet by 18 feet. Silo, as shown, is formed of deals, which fix into grooves in columns of shed, and can be fitted in as the work progresses. Silo and roof *removable*, if wished (see Figs. 51, 52). The roller can be emptied and removed to other silos on the farm or adjoining. The cost of this plan is the *first and only cost of the roller*, and the cost per ton of ensilage made is almost inappreciable. The maximum of pressure with the minimum of labour is obtained. The lightness of empty roller enables it to be got in and out of silo more conveniently (it is easily rolled on an inclined plank into silo, and then filled *inside* silo) besides greatly reducing the cost necessary if made *solid*. Messrs. Pearson likewise maintain that by repeating or multiplying the pressure, it may be from 3 to 5 cwt. per square foot or more, the grass, if wet when siloed, is wrung and dried, and the resistance of the water destroyed, and the ensilage made more adaptable to a concrete compression and preservation. The spring and sinkage in the grass are likewise minimised. Progressive rolling and pressing in layers should be followed, so that when the top is reached the grass is one solid mass. The late Dr. Voelcker, Chemist to the Royal Agricultural Society of England, recommended packing or pressing in 3 or 4 inch layers; and this is likewise the method adopted by M. Goffiert, the great French *Ensilageur;* the closer and harder you pack the grass the more you check fermentation, *which is the great secret of making good ensilage.* The great pressure inflicted by this simple means must be self-evident.

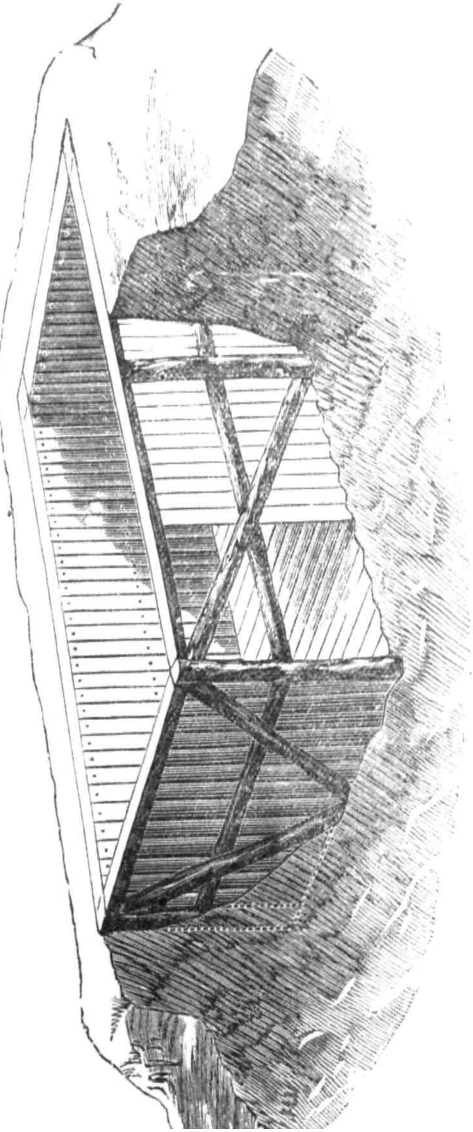

Fig. 52.

One ton (say weight of roller) distributed over the breadth of the silo, which is say 10 feet, gives 2 cwt. of pressure at every point, and this can be repeated, just as the blow of the ponderous block is repeated in *pile*

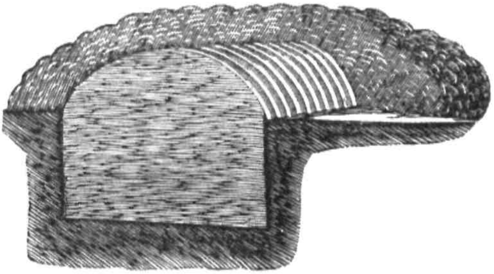

Fig. 53.

driving, for the recurrent and impulsive force in each repetition of the rolling is on the same principle though differently applied. Just suppose the ensilage a vast *pile* to be forced down, you cannot apply the ordinary

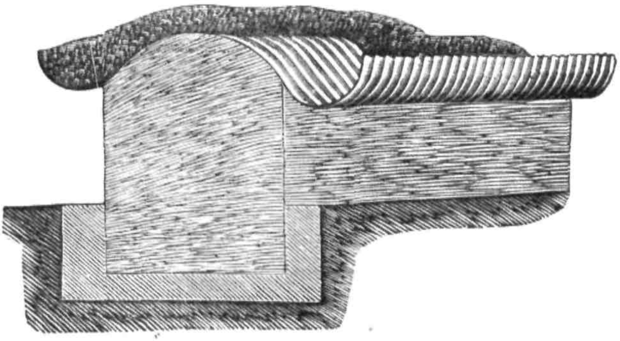

Fig. 54.

pile-driving apparatus, but you can use the roller, which is a simple and effective substitute, where you have a large surface to embrace and to press down.

To make our remarks and illustrations complete, we

give in Figs. 52, 53, and 54, sketches of simple methods of forming and covering silo, introduced by Messrs. Pearson, which will explain themselves.

We have given a marked prominence to the ensilage system of treating farm produce, not merely because it is one which promises great economical results, by removing some of the difficulties surrounding the farmer in attempting to make his work pay, but also because, as the reader will have doubtless discovered from the way in which we have treated our subject, a number of lessons applicable to small farming may be gathered from its connections. The questions will naturally arise, What is the probable future of the ensilage system? Is it likely to take as *permanent* a position as it has during the last few years taken a *prominent* one? Or is it destined to go through the process, which has been the fate of many a farming improvement, so called, of being for a time freely criticised and written about, and even to a large extent adopted, and then after a period more or less extended, being at last passed over to the wide class of neglected and forgotten things? To answer these questions fully would take up much more space than our pages can possibly afford, and which the scheme and scope of our work do not include.

CHAPTER XXIII.

CARE AND FATTENING OF STOCK.

Talking one day with a friend on the pertinacity with which a certain class of farmers clung to certain modes of treatment of their stock, or of working in the field, I made the remark that the strange thing about it was, that they persisted in doing such absurdities after their reason was convinced as to the loss they sustained by following them. How often have I heard one say, after being remonstrated with on a certain wrong method of operation, "Oh, well, it's all true!" admitting, with marvellous *nonchalance*, the fact, but still finding some excuse for not obviating the evil of it. It is all very well when these absurdities are carried out with insensate objects; but the case assumes a different aspect, and involves higher moral considerations, when the comfort of animals is concerned. I remember well, the first time I saw one of Bewick's marvellous "tail-pieces." It represented a winter scene—a ruined cottage, half hid in a snow-wreath. On a bare space before the door stood a ewe, in the last stages of miserable thinness, nibbling at the *stump of an old broom*, as if that were to give a supply of the milk which the innocent lamb was vainly endeavouring to obtain from her. Simple as the subject was, there was a depth of pathos in it which fairly startled me into tears. The feeling has never left me, and many, many a time does the picture rise up in all its painfulness before me, and never more so than when I see—as I am pained to say I too often, in my country rambles, do see—young cattle in the fields in winter time, vainly

trying to pick up through the frozen snow the scanty feed which the humanity of their owners denies them on easier-got terms and in fuller quantity. I never see them shivering with the rude blasts of winter whirling around them, but I think of Bewick's sheep nibbling at the old broom, to keep the life in her and in her poor lamb, so pitifully tugging at her teats. I know of a case not long ago where a few young cattle were actually starved to death. They had been left for weeks without shelter, and for many, many days the scanty herbage was covered with frost-bound snow. There is something to me inexpressibly painful in the thought of *what* these poor animals must have gone through the last few days of their miserable life. And yet the practice is defended, from its utility. Well-named is it—"hardening," or "roughing!" Sure am I that the owner of the above poor animals must have gone through the processes thoroughly himself. I cannot suppose that in such cases as I allude to, that any thought whatever is given to the matter by the men who can so unfeelingly treat their stock in the way I have spoken about. They must know, and they ought to know, as it is their *business* to know everything about their calling, that cattle are in reality most delicate creatures, keenly sensitive to what we in our own case would call "personal discomfort." I can get no shorter expression to denote what I mean; and if this comfort is not attended to, a heavy loss is sustained. I am well aware that this "*hardening*" or "*roughing*" process—how fitly chosen these names are!—is considered a valuable one, as it tends to improve the animals subjected to it.

Now hear what the *very highest* authority in cattle-breeding and rearing says on this point. If some of my "roughing" friends would only treasure them up, and act upon them for a time, I am certain they would tell me that the words were worthy to be blazoned in gold, and hung up in every cattle-breeder's home. The system of roughing, my authority remarks, "has the effect of weakening their constitutions; and this system pursued towards the young stock for two or three gene-

rations will ruin the best breed of cattle in the country. The offspring, after this time, will have lost all the quality, early maturity, and propensity to fatten of their ancestors; and *it will require years of the greatest care* to recover what is thus lost." I have emphasised the last sentence, as you will perceive; but if, my friend, I were to emphasise every word of it in the ears of some "owd Smiths" I wot of, I would be met with cold indifference, and be shut up, very likely, with the never-failing maxim of the family rejoicing in that ubiquitous name—"Ah! it's all very well, this book-larning, but there's nowt like practice." I declare, my dear Berzilius, when I think of the use some men put their reason to, I am like to go to buffets with myself, as belonging to the same *genus hominem.* But what matters it, after all? I need not sour my ale with their thunder. In China, when a man has to carry a chest of tea, he slings it from one end of a pole, which he carries on his shoulder, duly balancing the same with a huge stone dangling from the other end. An Englishman who saw a John Chinaman thus loaded, suggested that he might as well balance the one chest of tea with another, and thus carry in one journey a double weight. He was mildly met by the answer, "Our fathers did so; are we wiser than our fathers?" Some of the "owd Smiths" have doubtless a hearty contempt for the barbarous Chinese; but in many things they themselves show as much reason as did the Chinaman, and might aptly enough paraphrase his speech; "There's nowt like practice; my feyther did it afore me; would you ha' me wiser than my feyther?"

As this process of "roughing" or "hardening" of cattle is still highly esteemed by many, let us see, if you have time and patience, Berzilius, to listen to my prosing as to how far the practice of eminent feeders bears this notion out. In the last conversation we had—if that can be called conversation where I alone was the speaker—the subject of the chemistry and physiology of food was pretty fully explained. In that conversation I pointed out that there must be a properly-

adjusted balance between the nitrogenous, or flesh-forming, and non-nitrogenous, or respiratory, or heat and fat producing substances. Purely nitrogenous substances cannot support life and health, any more than purely non-nitrogenous substances.

From the above it will be perceived that, in addition to the supplying of flesh-forming principles, the food has also to support respiration, maintain the heat, and assist in laying on fat. The increased weight of the animal is therefore no index to the amount of food consumed by it. The maintenance of the functions we have named requires, it has been estimated by Boussingault, a quantity of flesh-forming substances, over and above that required to increase the weight of the animal by adding to its flesh equivalent to 18 oz. These may be obtained by the consumption of a weight of 12 lbs. of wheat-floor, and 60 lbs. nearly of turnips. From 4 to 5 lbs. of carbon are also daily converted into carbonic acid, this amount being obtained from a weight of 1,000 lbs. of turnips. This extra consumption may be called the "unproductive part of food;" and it is of importance to reduce its amount as much as possible. This may be done by attending to certain points; and first, as to *the loss of food consumed in maintaining the heat of the animal* under disadvantageous circumstances. Dr. Playfair has likened the body of an animal to a furnace; in which a quantity of food is consumed to produce a certain amount of animal heat. The animal heat always being equal, and the temperature of the air always varying, the colder the weather, the greater the amount of food consumed, so to speak, in the animal furnace, in order to keep up the heat to the proper degree. The less the difference, then, between the heat of the animal and that of the atmosphere, the less food will have to be consumed. Other circumstances being equal, the warmer the cattle are kept, the quicker will be their rate of fattening. Heat, then, in some sense, may be said to be food. This balance of temperature is well maintained by proper shelter, and in this way stall-feeding is peculiarly

advantageous, as the temperature of the house is generally higher than that of the external atmosphere. But while maintaining this excess of temperature, care should be taken that a due ventilation is secured. If this is not attended to, the health of the animal suffers, and the quantity of food consumed being necessarily lessened, enough is not taken to fatten at the rate and to the degree required.

Muscular exertion increases the activity of the organs of respiration, is a powerful agent in the waste of the tissues, and greatly increases the expiration of carbonic acid. Exertion, then, is equivalent to consumption of food; *quietness* equivalent to economization of it. It is in this way that stall-feeding operates so advantageously, for the animal is always confined to one spot in his stall. This quietness is also aided by darkening the apartment in which the animals live, and rigidly excluding from it all comers and goers, allowing no one to enter except at stated intervals for necessary purposes.

The *bulk* of *food* is another important point, and should not be lost sight of. Although nutritive matters are essential, the food must assume sufficient bulk to aid in the functions of digestion. Without this necessary bulk, the effect of nutritive matters of food is injured; the addition, therefore, of woody fibre, by increasing its bulk, adds to the value of the food.

Another point of importance is *regularity in feeding.* This is essential, first, as inducing regularity of habit in the animal, as that of sleep; and secondly, in supplying food as soon as desired by the animal.

Briefly recapitulating, then, we find, *first,* that in addition to a proper selection of food, so that there shall be a proper balance between the nitrogenous or albu-
you ous and the non-nitrogenous or saccharine and oily
prosi ances, there shall be, *second,* shelter, so as to secure
this ntenance of the proper degree of heat; *third,*
that cation and cleanliness; *fourth,* quietness, and, in
speaker ases, darkness, or rather half gloom; *fifth,* ad-
of food it of the bulk of food; and, *sixth,* regularity in
sation To these must be added a *seventh,* and not the

least important of the requirements necessary to carry out a successful system of feeding, namely, attention to the state of the animal's general health. To aid in this, in addition to ventilation and cleanliness, attention must be given to the excretions, so that regularity of action be secured, and all tendency to scouring or the reverse be avoided. This latter point can be attained by attention to the food used, rape or oil-cake having a laxative, bean-meal a constipating effect. Judicious feeding consists in giving an admixture of food, so that the properties of one shall correct all injurious tendencies of the other, care being taken to "lean somewhat towards the laxative side, as it is found that cattle are the most healthy, and feed best when in that condition."

To this list of requirements we may add an "*eighth*," namely, *variety of food*. When the food is changed judiciously, the appetite is kept always up to a healthy, vigorous tone. Food eaten with a relish develops fat quickly. You will thus see that the feeding and care of cattle is of a much more important and careful character, and demanding the exercise of a greater degree of skill, forethought, and kindness than some of the "owd Smith" generation would care to acknowledge, if pressed for an opinion on the matter.

A few remarks on the modes in use for preparing food for stock will be useful.

Feeding Materials may be divided into two classes—first, those produced as ordinary crops of the farm, as hay, straw, and roots (as turnips, mangolds, kohl-rabi, potatoes), beans, peas, and certain qualities of cereals, as wheat, oats, and barley; and second, those obtained from foreign sources, as oil-cake, rape-cake, cotton-cake, and the like. Hay or straw or roots, used alone, cannot bring an animal in the quickest way and to the highest degree of fatness; to do this, such substances as oil-cake, bean-meal, and rape-cake are necessary.

Oil-cake—that is linseed oil-cake—has long been used as a feeding material, and is very highly esteemed. Its use is undoubtedly remunerative, when given along

with turnips at the rate of 4 to 6 lb. a day; 10 to 12 lbs. have been, and are in some cases still, given; no roots, but hay alone being used. It is understood that fattening cattle receiving 5 lbs. of oil-cake along with half the usual quantity of turnips pay better than if fed wholly on turnips. Linseed itself is sometimes used as a feeding material. The great advocate for this species of food is Mr. Warnes, who holds that by the peculiar combination of linseed with corn—both the produce of our own soil—a cheaper and more profitable kind of food would be obtained than by the use of *imported oil-cake.*

The following are extracts explaining Mr. Warnes' method of using the linseed in conjunction with other food:—

"The seed (linseed) must be first reduced to fine meal, 1½ lbs. of which, stirred into 12 lbs. of water while it is boiling, with 4½ lbs. of barley, bean or pea-meal, and given to a bullock of between 40 or 50 stone (5 cwt. to 6¼ cwt.) every day, will, in addition to Swedish turnips, be quite sufficient, or perhaps more than he would be inclined to eat. This small quantity of linseed will act well on the stomach, and the bullocks will thrive and fatten in a degree that can scarcely be credited, except by the person who tries the experiment. In no instance has it failed. . . . .

"Either potatoes, carrots, turnips, or mangold-wurzels, boiled and incorporated with linseed-meal, form a compound upon which cattle fatten with great rapidity. To make it, nothing more is required than to fill the copper with washed potatoes, carrots, &c., sliced. Supposing the copper would contain eight or nine pails of water, let only one be added. In a few minutes the water will boil, and the steam will speedily cook the roots; then a convenient portion should be put into a stout-bottomed trough, with a little linseed meal, and mashed with the rammer, while a boy turns it over. The remainder must be prepared in the same way. As the mass increases in the tub, it should be firmly pressed down, in order that it may retain the heat as long as

possible. The length and size of the rammer ought to be adapted to the height and strength of the person employed. It will be found convenient to have two or three at hand, varying from eighteen inches to two feet long, tapering, and from four to six inches square at the bottom. A pin should be passed through the top, for the convenience of being worked with both hands."

The following is Mr. Warnes' method of making what he called his "bullock compound:"—

"Put 150 lbs. of water (15 gallons) into an iron boiler, and as soon as it boils, not before, stir in 21 lbs. linseed meal; continue to stir it for about five minutes, then let 63 lbs. of barley meal be sprinkled by the hand of one person upon the boiling mucilage, while another rapidly stirs and crams it in. After the whole has been carefully incorporated, which will not occupy more than five or ten minutes, cover it down and withdraw the fire. The mass will continue to simmer, from the heat of the cauldron, until the meal has absorbed the mucilage. On this compound being removed into tubs, it must be rammed down to exclude the air, and prevent it turning rancid. The compound will keep a long time, if properly prepared. The consistency ought to be like clay when made into bricks."

The use of Rape-cake as a feeding substance is now becoming rapidly extended. It possesses many advantages; it is cheaper by nearly one-half than linseed-cake, while its feeding capacities are equal to it. Wolff has proved that in feeding it is more equivalent to *twice its own weight of hay*; and in milk-producing qualities, 1 lb. of rape-cake will produce 1 lb. of milk.

Dr. Voelcker gives the following statement as to the feeding value of rape-cake, compared with linseed cake. The result of the examination of various foods:—

	Linseed.	Rape-cake.
Moisture	12·44	10·68
Oil	12·79	11·10
Nitrogenised flesh-formers	27·28	29·53
Heat-giving substances	41·36	40·90
Mineral matters, ash	6·17	7·79

The great objection urged against its use is the dis-

like which cattle have for it. To accustom them to it, Dr. Anderson recommends the bulky food, as turnips and straw, to be diminished in quantity, replacing it by some substance, as grain, containing in smaller bulk the same amount of nutriment; then "the craving for a sufficient quantity to fill the stomach will induce the animals to consume the rape, and after a few days they become completely accustomed to it."

Where rape-cake is used in conjunction with other food, and steamed or cooked, it is worthy of observation that if it (the rape-cake) is treated with boiling water, or the mixture heated beyond the boiling point, all acridity disappears, and the animals eat it with avidity. Mr. C. Lawrence, of Cirencester, was the first to notice this—at least, to draw public attention to it—and, on his representation, Dr. Voelcker carefully examined some rape-cake, and furnished the following report:—

"I believe the pungent principle in rape-cake arises from the presence of mustard-seed, which is often contained in considerable quantities in foreign rape-cake. Mustard and rape-seed belong to the same family of plants, and in Germany, at least, I am sorry to say, our rape-fields are often very foul with mustard. That boiling water prevents the pungent, acrid smell is fully explained by the chemistry of mustard-seed. That seed does not contain any volatile or essential oil of mustard, the cause of the pungency of mustard taste; but it does contain two peculiar principles, which, in contact with cold or tepid water, generate essential oil of mustard—the one is called by chemists 'myronic acid,' the other 'myron.' The latter is a substance like albumen, and, when moistened with cold water, acts as a kind of ferment upon myronic acid, producing the acrid oil of mustard; whereas boiling water coagulates myron like albumen. In a coagulated state, myron loses its efficacy as a ferment, and consequently no pungent or acrid smell is produced when cake containing mustard is mixed in boiling water. . . . . However, the practical result of mixing rape-cake with boiling water deserves to be generally known, for even pure mustard-cake will

lose its poisonous character—or, more correctly, its poisonous qualities will not be called into existence—if it be mixed with water at the temperature of 212° Fahr."

BEANS form a valuable food for fattening cattle. They should never be given whole, but be crushed by a crushing-machine, or ground into meal; bullocks weighing from 7 to 8 cwt. may get from 3 to 6 lbs. of the crushed beans or bean-meal. It is a usual practice, however, to mix the bean-meal with crushed oil-cake, the quantities of each being equal; and the mixture being given to the extent of 6 lbs. per day to each bullock at two feeds. Where PEAS are used, they should also be crushed or ground into coarse meal, and mixed with oil-cake, as above.

Where turnips and straw or hay are alone used as the feeding materials, the quantity of turnips given at the mid-day meal has been recommended to be smaller than that at the morning and evening meals, as the intervals between are longer at those two last meals. The supply of turnips is given to the cattle in the troughs, which have been previously cleaned out, so as to remove all traces of former meals; after they are consumed the cattle are supplied with fodder, straw or hay—the latter freshly made up—and the animals left quietly to ruminate till next feeding time. The weight of turnips consumed per day by each herd of cattle will vary according to circumstances—say 11 to 12 stones for cattle weighing from 5 to 6 cwt., and 16 to 18 stones when they weigh 8 to 9 cwt.

STRAW.—Circumstances have arisen during the last two seasons to set a higher value upon straw as a feeding material than it at any previous period possessed; and it is to be hoped that attention will now be paid to its use, in order to ascertain the most economical way of applying it in conjunction with other kinds of food. One hundred parts of field and meadow hay give, on an average, sixty-three parts of feeding value, while straw, on an average of the three varieties, wheat, oats, and barley, yields forty parts—a comparison showing that straw possesses in reality a much higher value than

has been acceded to it. To obtain the full value of straw, it must be used along with other feeding materials, as roots, oil-cake, and the like. An allowance of roots, from 65 to 70 lbs. per day, with 3 to 4 lbs. of oil-cake, has been found in practice to create a considerable degree of appetite for the straw; with this feed, the fattening beasts have done well, and have made a profit. It is not to be wondered at that the animals should turn from straw with disgust when they have been over-supplied with roots to the weight of, say, 100 lbs., and with oil-cake to the weight of 10 to 12 lbs. per day. In such a case, their palled appetites can only be stimulated by hay.

There has been much written and said with reference to the *cooking of cattle food*, and opinion seems pretty equally divided upon the subject. Upon the whole, evidence, we think, is more favourable to a *portion* of the food being cooked than to the whole of it.

A variety of opinions exists amongst agriculturists as to the benefit to be obtained by the *pulping of roots*. These opinions, like many others on agricultural questions, are very conflicting, but upon a careful examination of the matter, *pro* and *con*, it may be safely admitted that considerable advantages will arise from the giving of pulped food to feeding animals. For full information on the point, the reader is referred to vol. xx., part 2, of the *Journal of the Royal Agricultural Society of England*, p. 458. From a short paper by Mr. T. Duckham, Baysham Court, Ross, Herefordshire, I extract the following, as comprising nearly all that can be said as to the advantages of pulping or mincing roots:—

"1st. Economy of food, for the roots being pulped and mixed with the chaff, either from threshing or cut hay or straw, the whole is consumed without waste, the animals not being able to separate the chaff from the pulped roots, as is the case when the roots are merely sliced by the common cutter; neither do they waste the fodder as when given without being cut. 2nd. The use of ordinary hay or straw. After being mixed with the

pulp for about twelve hours, fermentation commences; and this soon renders the most mouldy hay palatable, and animals eat with avidity that which they would otherwise reject. This fermentation softens the straw, makes it more palatable, and puts it into a state to assimilate more readily with the other food; and in this respect I think the pulp of great value, particularly upon corn farms, where large crops of straw are grown, and where there is a limited acreage of pasture, as by its use the pasture may be grazed, the expensive process of haymaking reduced, and consequently an increased number of cattle kept. I keep one-third more, giving the young stock a small quantity of oil-cake, which I mix with the chaff, &c. 3rd. Choking is impossible, and I have only had one case of hove in three years, and that occurred when the mixture had not fermented. 4th. There is an advantage in mixing the meal with the chaff and pulped roots for fattening animals, as thereby they cannot separate it, and the moisture from the fermentation softens the meal, and insures its thorough digestion; whereas when given in a dry state, without any mixture, frequently a great portion passes away in the manure."

Mr. Charles Lawrence, of Cirencester, makes a thick soup of hot water and rape-cake; this is mixed with chaff and pulped roots. Each animal consumes per day 56 lbs. of pulped roots, 3 bushels of chaff, rape-cake 4 lbs. The weight of rape-cake at first trial is 1 lb. per head per day, gradually increasing it to 4 lbs. as above. Rather more than 2 bushels of chaff are mixed with the pulped roots, and given at two feeds, morning and evening, and the remainder is given with the cake in the middle of the day. 2 lbs. of mixed meal are added to the trough of each animal along with the mid-day meal. Care is taken to have the rape-cake soup boiling hot while it is poured over the chaff.

A brief notice of the varieties and characteristics of fattening stock may be useful. The reader will find it in the next chapter.

CHAPTER XXIV.

TREATMENT OF CALVES AND YOUNG CATTLE.—VARIETIES AND CHARACTERISTICS OF FATTENING CATTLE.

THE maxim which some hold to be correct, "In treating farm stock, follow the teachings of nature," seems at first sight to be a good one, and one universally applicable. On the other hand, however, it ought not to be forgotten that by long continued and peculiar processes of breeding and training, we have brought many of our animals into a kind of artificial condition very far removed, indeed, from their original ones, and which necessitates, so to speak, a kind of treatment somewhat different, and in many points essentially so, from that which we would find to be the case in their strictly natural or original condition. For instance, when we think of the herds of the plain and the cattle upon a thousand hills, we at once associate with them all the ideas of unrestrained liberty and continual exposure to the winter's blasts, no less than to the summer sun; and yet we know that stall or box fed animals are frequently perpetually confined, and yet maintained in good health, and in a capacity to perform all their functions. At the same time, in some points connected with the feeding and rearing of stock, the value of the lessons afforded by a study of nature cannot be overestimated: although, in many instances, we find them totally neglected. Perhaps this applies more directly, and with greater force, to the treatment and rearing of calves than to other varieties of farm stock.

The treatment of the calf varies very much in different localities and amongst different breeders. Some rear the calf on milk alone, some on artificial substitutes for

it; some leave the calf with its mother for a short time that she may lick it, others leave it with her for a fortnight only, and so on, practice varying with circumstances of locality or opinion. Where the cow is not allowed to suckle the calf, it is removed immediately on being born to a separate crib—this should be placed where good ventilation and light are secured—the latter is not wanted where the calf is to be reared for veal—well rubbed over with straw, and afterwards hand-fed with the warm milk. The feeding is done three times a day, and for the first three or four weeks milk is the only food required—eight or ten quarts daily will be consumed. The calf having an early *penchant* for nibbling, a few broken pieces of oil-cake should be put into the manger, and it will thus get accustomed to consume this essential element in good feeding. It is also gradually trained to eat turnips sliced, and hay. When able to eat these, and at about six weeks old, the allowance of milk should be given at two meals instead of three. As the quantity of hay, roots, and linseed is increased, the quantity of milk is proportionately decreased. After the calf is six weeks old, a little exercise will be beneficial in a dry, open, but well-sheltered yard.

Another method of rearing a calf is to allow it to suckle the cow for a short time. The cow licking the young animal promotes its circulation, while the mucus with which the calf is covered at birth, acts as a proper purgative to the cow. If very weak, the calf should be assisted to suckle, a little milk being given by hand, till it gains strength. The calf is confined within a crib, and it is allowed to go to the mother on its return from the pasture. The course of practice "is modified by some breeders, who, after allowing the calf to suck ten days, allow it six or eight pints of new milk twice daily, and after this has been continued two or three weeks, *gradually* substitute *skimmed* milk for the new milk, adding oatmeal porridge, and allowing the calf cut roots and hay until it is ten weeks old, when the new milk is entirely stopped. Other breeders, when the new milk is removed, use as a substitute a quarter

of a pound crushed linseed, a quarter of a pound bean-meal, a quarter of a pound molasses daily, made into eight or ten quarts of soup; and this is decidedly a good artificial food for calves" (Professor Tanner).

Where the supply of milk is very small, the following has been recommended in the *Irish Farmers Gazette*:—

"Rearing calves without some portion of milk should not be attempted; but with some milk good calves can be reared as follows:—On three quarts linseed-meal and four quarts bean or pea-meal pour thirty quarts boiling water, cover up well for twenty-four hours, then pour it into a boiler holding about thirty quarts more of boiling water; give it half an hour's boiling, stirring it well all the time, then put by for use, giving it to the calves milk-warm, mixed with milk. The calf should get its dam's milk for the first week, when the mucilage may be mixed with it, at the rate of one-third mucilage to two-thirds milk, gradually increasing the mucilage and decreasing the milk till the seventh or eighth week, when the milk may be entirely withdrawn."

As before stated, artificially prepared food is sometimes substituted for the milk in the rearing of calves. The following is Mr. Beamish's plan, as given by Mr. Pringle in his highly useful treatise on "Meat Manufacture":—

"Thirty quarts of boiling water are poured on three quarts of linseed-meal and four quarts of bean-meal, all then close covered up; and at the end of twenty-four hours added to thirty-one other quarts of boiling water then on the fire, being poured in slowly to prevent lumps, and being well stirred with a small, flat, shovel-shaped board, perforated with holes, to produce thorough incorporation. After thirty minutes' boiling and stirring, the mucilage is put by for use, to be given blood-warm to the calves as soon as they are three days old; first in equal portions with new milk, increasing gradually to two-thirds, as the calf gets older, substituting skim milk after a month, and feeding on muci-

lage alone after six weeks. This mode of feeding will be as follows, viz. :—

Weeks.	New milk. Quarts.	Skim milk. Quarts.	Mucilage. Quarts.	Total per Week. Quarts.
1st	22	—	10	32
2nd	21	—	21	42
3rd	20	—	29	49
4th	20	—	36	56
5th	—	20	43	63
6th	—	20	50	70
7th to 15th ..	—	—	756	756
	83	40	945	1068"

With regard to the use of these artificial foods for calves, it may be accepted as a safe rule, that, if their use can be dispensed with, and the milk given, it will be the most economical plan, and in every way the most satisfactory. Milk is the natural food of the calf. The "beisting," as the milk first drawn from the cow is called, contains an unusually large quantity of cheesy matter, and its use by the calf prevents costiveness, and aids its delicate digestion. "Milk again," says *Johnson*, "*is a perfect food for a growing animal*, containing the curd which is to form the muscles, the butter which is to supply the fat, the phosphates which are to build up the bones, and the sugar which is to feed the respiration. Nothing is wanting in it." The "internal organism of the calf points to the use of milk *alone* for the early period of its life, and a careful observation of the most successful practice tends to confirm this opinion. For the same reason, we may also learn another lesson from the natural habits of the animal—that the supplies of food should rather be moderate and frequent than larger in quantity after longer intervals. . . . We find that calves which run with the cow thrive better than others, because they can draw their supplies of milk frequently, and in small quantities—in fact, at such times as they feel the want. . . . . No doubt it may be questioned whether this is an economical method, and one desirable for general adoption; but there are cases which render such a

course absolutely essential to success, and, I believe, in many other cases the question of economy is too often viewed under the contracted aspect of present cost rather than future return."

"In rearing a calf," says Professor Tanner, from whose paper on Rearing and Breeding Cattle, in *The Journal of the Highland Society*, 1860, the above is taken, "there is one object to be kept steadily in view, and that is to promote the development of the body as much as possible. In the calf which is to be fattened and killed, no one will dispute it, and I believe it will be equally important in the case of those which are to be reared for beef, but it is still more important in rearing breeding stock."

The following is the method of fattening calves I adopted. For the first fortnight they were fed on the sweet milk of the mother, getting from six to eight quarts daily—more frequently the latter than the former quantity ; this we gave at three times in the day—morning, noon, and night. The noon meal I considered of essential importance. The interval usually observed from morning to night is far too long for a weakly animal to fast; getting hungry, the whole afternoon is spent in fretting and uneasiness: now, no animal can make satisfactory progress in this state. The noon meal, therefore, I insisted upon the calves getting. After the first three weeks skimmed milk is given thick with linseed and wheat-meal. The linseed is made into a jelly by stewing it with water—thirty quarts of water to three quarts of the seed. The wheat I ground down to meal in one of Whitnell's Domestic Flour Mills—which, I may here state, was of the greatest service to me in the preparation of my cattle-food. The wheat thus ground down is rich in all the constituents necessary to support and build up the frame of the calf. The food is greatly relished by the calves. A quantity of wheat-meal equal to a little over a pint, with four quarts of skimmed milk, given three times a day. The calves were then gradually trained to eat small lumps of oil-cake, and to nibble at

hay and pieces of roots. When about six weeks old, the skimmed milk was only given once a day—at noon—and the evening and morning meals consisted of a mash of chopped hay, with lumps of oil-cake strewed amongst it. Roots were also given them to eat, with a handful of uncut hay after they had eaten their chop. Their drink was water with a little milk or meal in it.

The calves should, if possible, be ready to wean in the month of May. Before putting them out to grass, the calves should be accustomed to the use of green meat; some early vetches, rye, clover, &c., will prepare the stomach for the succulent food of the pastures. The weather being mild, and the herbage in good condition, the calves should be put out, and on young pastures or recently laid down grasses rather than old pastures. As cold is prejudicial, it will be advisable to shelter the calves at night. A good supply of water and a change of pasture are desirable for the first summer. The calves should be put into the pastures first, the older cattle following and finishing up. The supply of oil-cake should be kept up, to prevent those checks in the growth to which allusion has already been made. In some cases the calves are not turned out, but are reared in well-littered yards and sheds, green food and oil-cake being given to them.

Young Cattle.—As autumn advances, and shortening days bring chilly nights, the young cattle should be brought from the pasture-fields and placed under appropriate shelter. This should not be given to them in the shape of too closely confined and warm buildings, which are apt to induce a sickly and debilitated condition in the animals, and render them less hardy and more liable to the attacks of disease. No arrangement for wintering young cattle can excel the court with dry sheltered sheds. Here that exercise so essential to the healthy development of the young animals will be obtained, and shelter from biting winds and dashing rains obtainable. As to the too often indulged-in habit of roughing the animals in the open fields or yards, all the winter, nothing more need here be said; what my

opinions on this point are the reader already knows. It is altogether opposed to the true principles of feeding —already, or hereafter explained in the present division. Where cattle are thus used, "their owners," to quote an authority I have often appealed to, "are following a course which is opposed to their own interests." It is, indeed, a course which the dicta of science as well as the experience of practice show to be a very foolish one. The medium course, between the absolute want of artificial shelter, and having it of too close and confined a kind, is the best.

Of the various breeds adapted for fattening quickly and economically, the Shorthorn is acknowledged to be the best. Other breeds, as the "Hereford," Devon, and Scots, or Kyloes, are good fatteners. We give the following notes on the varieties and characteristics of fattening cattle:—

Improved Shorthorns.—The main object in producing cattle of this breed, is to secure rapid and perfect "meat-making," the "milk-giving" properties being secondary in importance; "their ponderous forms," says Mr. R. Smith in the *Journal of the Royal Agricultural Society*, "rapid growth, and early maturity are the guarantee both for the economical conversion of food into flesh, and for the manufacture of first-rate manure for succeeding crops. Let me try," continues the same writer, "to describe a model specimen of the breed. He should have a symmetrical and compact form, of sufficient size, on shortish legs; the body should be covered evenly with flesh, of a mellow and elastic nature, yet firm enough and springy to the touch, following the fingers when the pressure is withdrawn; the forehead should be open, without a contracted air about it, and tapering gracefully to the muzzle; the eye prominent, yet placid; neck moderately long, neatly running into the shoulders, which should be well laid, gracefully fitting into the forequarters; the girth good over the heart; the forearm, where it joins the body, broad and tapering with fine bone below the knee and fitting level into the girth,

and so maintaining a straight line along the whole animal to the extremity of the hips; the neck-vein should be prominent and well filled up with flesh, running neatly into the shoulder joints, which should not be prominent (*i.e.* rough), but well covered, the muscle on the outside of the shoulder being well developed; the ribs should spring well and level from the backbone, increasingly so towards the back-rib, which should be well home to the quarter; in fact, the space here (termed the false-rib) should carry on in a straight line over the hip, gradually tapering to the side bones at the tail, but the quarter must be well packed, not 'scooped out,' so to speak; the hip-bones should be dovetailed into the quarter and false-rib so completely that one ought to be at a loss where to find them; *i.e.* they should not be too recognizable; the flank will then, as I have already said, be deep and full, forming a parallel line with the animal's back from the bottom of the girth; the back again, from behind the top of the shoulder all along the vertebræ should be well covered; the loins should be wide and thick; the bone, or ridge along the quarter, should form a straight line in continuation with the back, and should also be well covered (which in a great many animals it very imperfectly is) to the same level; the hirst should be straight down (square), moderately wide and deep, containing a great deal of heavy flesh, and the legs should be well under the animal; there should be a thick coat of mossy hair, not sharp, or what is termed wiry.

"Altogether, such an animal will have an ease and grace of motion as it walks which is only attained when the whole formation is in perfect harmony. There is invariably, too, a style and grandeur of appearance unmistakably stamping the 'high caste' shorthorn. Many well-bred animals will not feed level, but get patchy, which is fatal to them as show animals, however stylish and fashionable in their outline. It is, therefore, indispensable that an animal should lay on flesh uniformly on every part, so as not to spoil the proportion of the several parts. Rough shoulders are

always accompanied by heavy open shoulder-blades and a slack, bad girth, deficient through the heart as well as the top of the plates immediately behind the shoulder. The animal is also sadly deficient in neck-vein, very weak and ill-filled where it joins the shoulder-points. Again, however good an animal is in all other respects, it is imperative that the hind-quarter be well finished and neat; nothing proclaims a low-bred character so distinctly as an ill-turned quarter. If the tail is not neatly set on, failing to come well out to form the square at the hirst, you may be sure something is wrong. While, however, the tail is well set on, and the side bones sufficiently high to carry the flesh fully up to the level of the quarter, there should not be any redundancy to mark and separate the rumps from the adjoining quarter. The hind legs must not be overlooked; if the hocks are too much bent, too long, or not well under the animal, it is a serious objection. The hind legs should be nearly straight, and well under the animal; this not only looks well, but is a mark of strength as obviously the reverse is one of weakness."—*Journal of Royal Agricultural Society of England*, vol. xx., p. 330.

The "Hereford" breed was formerly in high repute for the draught purposes of the farm. This purpose being, however, nearly set aside, the breed is more prized for his "beef-producing qualities, for which his scale of form, early maturity, and aptitude to fatten render him highly distinguished." The following, according to Mr. Smith, from whom we have already quoted, are the characteristics of the breed:—"The face, mane, throat, the under portion of the body, the inside and lower portion of the legs, and the top of the tail are beautifully white; the other parts of the body a rich red, usually darker in the male than the female; the horn is white or light yellow, of a waxy appearance, sometimes tipped with black. The forehead is broad, with spreading horns; those of the bull straight and level with the poll, and of the ox and cow slightly curved, with an upward tendency. The eye is full, yet

of a passive expression, denoting the quietness of disposition and temper characteristic of the Hereford, and which is of paramount importance to insure the profitable feeding of all ruminating animals. The cheek is fine, the head small in proportion to the carcase, which is long, level, and cylindrical. The hide is thick yet mellow, and well covered with moderately long soft hair, having a tendency to curl. The brisket is prominent, the chest well expanded, and the breed is eminently distinguished for neatness of shoulder; the bone being thin and flat, the kernel full up, the outside shoulder well covered with mellow flesh, the chine good, the loin broad, the hips wide and level, the whole back displaying a straight line, well covered with flesh from the neck to the tail; the hirst-flank and fore-flank are good, the outside thigh is perhaps the most defective part. The whole body is well covered with rich mellow flesh, yielding with pleasant elasticity to the touch. The legs are short and the bone small, and the whole contour displays good constitution, and exhibits, perhaps, a larger proportion of flesh, in proportion to bone, than any other breed."

The "Devon," according to Mr. Smith, is eminently fitted for every hardship, the frame being compact, with the offal light; they have powers of great endurance; being "cast in a peculiar mould" they have a degree of elegance in their movement which is not to be excelled. As animal food producers they are unsurpassed, and, in consequence, they receive the first attention of the London west-end butchers. A first-rate Devon "has a prominent eye, with a placid face, small nose, and elegantly turned horns, which have an upward tendency (and cast outward at the end), as if to put the last finish upon his symmetrical form and carriage. These animals are beautifully covered with silky coats of a medium red colour. The shoulder-points, sides, and fore-flanks are well covered with rich meat, which, when blended with their peculiar property of producing meat of first-rate quality along their tops, makes them what they are—'models of perfection.'"

Some object to the North Devon, and class him as a small animal, with the remark, "*He is too small for the grazier.*" In saying this it should ever be remembered, that the Devon has his peculiar mission to perform, viz., —that of converting the produce of cold and hilly pastures into meat, which could not be done to advantage by large-framed animals, however good their parentage. The Devon may thus be designated the "pony of the ox tribe."

The following are the principal breeds of Scotland: —"Angus," or "Aberdeen," "Galloways," "Ayrshire," and "Highland," or "Kyloe."

The Angus or Aberdeen polled cattle breed has lately attracted great attention in this country and on the Continent. "Their massive frame, hardy constitution, quiet disposition, aptitude to fatten, and excellent beef, have tended to recommend them to the notice of breeders and feeders in these countries."

The "Highland," like the Devon, is highly estimated by the London west-end butchers. It is very hardy, and will pick up a living in places which would be virtually barren to other breeds. He well repays, however, any attention in the matter of fattening, by the rapidity with which the process is carried on, and the excellence of the beef which is produced. The size is small, the colour jet black, or light dun, the horns long, and are curved outwards and upwards; the body is covered with a soft coat, the hair long and curled. The beef is formed chiefly in the back, which keeps straight—the body being round.

Although I have already given "points" or indications which will enable one, in a general way, to judge of the properties of an animal proposed to be fattened, still an extensive experience alone can give those ready facilities for judging the value of stock, so practically useful, by their form. The "*touch*" *is one of the most* important points on which the feeder can rely. The state of the skin at once gives an indication as to the value of the animal. Its characteristics should be a softness and pliability which, while yielding a gentle

resistance to pressure, will present an elasticity which, allowing the pressed finger to give a mark or indentation to it, will enable it to rise again to its usual condition. The hair should not be straightly and closely laid on, nor stand straight out from the skin, but should have a wavy appearance as if it had a tendency to curl. The tendency to yield fat gives a roundness to the body; and breadth of carcase is indispensable—depth and width of chest, breadth at the hips, fulness and roundness of the crop, smallness and fineness of head—all absence of angularity—are other marks of a favourable character. The body should be such, that a balance is preserved in all its parts, that is, the length, breadth, and height of the fore and hind quarters equal. This will give the form of a rectangle, or oblong-square as it is sometimes called, with all the parts filled up. The illustration in Fig. 55 will give a good idea of the proper shape and form of a Shorthorn cow.

POINTS INDICATING A WELL-DEVELOPED BULL.

The head should be rather small in proportion to the animal, and well set on the neck, with a fine tapering muzzle, a broad forehead, bright, full, yet placid eyes, furnished with a graceful horn of fine quality, and ears small and fine.

The neck should be thick but not too short, but having a graceful appearance by tapering steadily towards the head, and yet not getting thin behind the ears.

The shoulder should be snugly in the carcase; it should be covered with a well-developed muscle down to the knee, below which it should possess a fine and flat bony structure.

The chest should be bold and prominent, wide and deep, furnished with a deep, but not a coarse dewlap.

The carcase should be barrel-shaped, having a top level and broad, especially across the hips. The ribs should be well rounded; the space between the last rib and the pin should not be too short, yet at the same time we must guard against too much length; there

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will, however, be little cause for objection if the rib is well rounded and the bone flat, for it will add weight to the animal in a good part. The flank should be full and pendent.

The hind legs should be full and fleshy down to the hock, with a well-developed buttock, showing great substance, but below the hock we require a fine and cleanly-formed bone.

The tail should be finely formed without much hair.

The hide mellow to the touch, covered with a fine yet plentiful coat of hair.

The above is from a paper by Professor Tanner on "Breeding and Rearing Cattle," in "Transactions of Highland Society," vol. for 1860, p. 341.

CHAPTER XXV.

DAIRY MANAGEMENT.—CHOICE OF COWS.—THE FEEDING OF COWS.—CATTLE-SOILING.

The cow and her management are the important points of the dairy department. You cannot churn profitably without good milk; and the more milk you get at the same cost of feeding the better. The principal breeds of dairy cows are the shorthorns, the Suffolk, the Ayrshire, the Kerry, and the Alderney. To these I may add the Brittany cow, which, from its smallness, neatness, and reputed good milking qualities, is now attracting considerable attention. It bids fair to compete favourably with the Alderney or Channel-island cow, which has long been a favourite for gentlemen's household dairies and for the play-farm of amateurs. Professor Gamgee, of the New Veterinary College, Edinburgh, pronounces the Brittany cow "to be essentially an animal for family use."

Of the breeds I have just enumerated, the Shorthorn is perhaps the best; certainly, from its reputation, it has been for some time influencing all other breeds, to a greater or less degree. So popular, in fact, is the breed, that even those not intimately mixed up with agricultural matters must have heard not seldom the term "Shorthorn," and have wondered, possibly, what it meant.

The principal breeds of dairy cattle are the Shorthorns, the Suffolk, the Ayrshire, the Kerry, and the Alderney or Jersey. Of these, the most important is the Shorthorn, as it is influencing almost every other breed, and is, perhaps, the most highly esteemed.

The following is a scale of points for Shorthorn cows,

as given in the "Transactions" of the Board of Agriculture of Lower Canada, which may be some guide to the reader in the choice of a cow :—

"Scale of Points for Shorthorn Cows.

"1. Purity of breed on male and female side; sire and dam reputed for docility and disposition, early maturity, and aptitude to fatten; sire a good stock-getter, dam a good breeder, giving a large quantity of milk, or such as is superior for making butter and cheese.

"2. Head small and tapering, longer and narrower in proportion than that of the bull; horns fine, and gradually diminishing to a point, of a flat rather than a round shape at the base, short, and inclined to turn up; those of a clear, wavy colour to be preferred, but such as are of a transparent white, slightly tinged with yellow, admissible; ears small, thin, and well covered with soft hair, playing quick, and moving freely; forehead of good breadth between the eyes, and slightly dished; eyes bright, placid, and rather prominent than otherwise, with a yellow rim round them; the lower part of the face clean, and well developing the course of the veins; muzzle small; nose of a clear orange or light chocolate colour, the former much preferred; nostrils wide and well opened; lower jaw thin; teeth clean and sound.

"3. Neck fine and thin, straight, and well set on the head and shoulders, harmoniously widening, deepening, and slightly rounding, in a delicate feminine manner, as it approaches the latter point; no dewlap.

"4. Shoulders fine and well placed; fore-legs short, straight, and well spread apart; fore-arm wide, muscular, slightly swelling, and full above the knee; the bone fine and flat below; knees well knit and strong; foot flat, and in the shape of an oblong semicircle; horn of hoof sound, and of a clear wavy colour.

"5. Chest broad, deep, and projecting; the brisket in a lower line than the belly.

"6. Barrel round, deep, and well ribbed to the hips,

" 7. Back short, strong, and straight from the withers to the setting of the tail; crop round and full; loin broad; huckle-bones on a level with the back; tail well set, on a level with the back, or very slightly below it, fine, and gradually diminishing to a point, and hanging without the brush an inch or so below the back, at right-angles with the back.

" 8. Hind-quarters from the huckles to the point of the rump long and well filled up; twist well let down, and full; hind-legs short, straight, and well spread apart, gradually swelling and rounding above the hock, the bone fine and flat below; foot flat, and in shape of

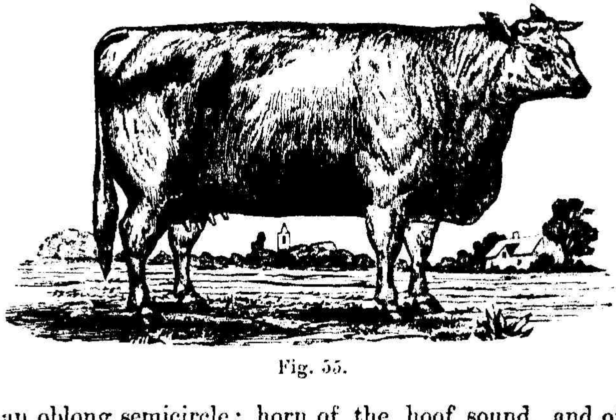


Fig. 55.

an oblong semicircle; horn of the hoof sound, and of a clear, wavy colour; legs not to cross each other in walking, nor to straddle behind.

" 9. Udder broad and full, extending well forward along the belly, and well up behind; teats of a good size for the hand, squarely placed, with a slight oblique pointing out; wide apart; when pressed by the hand, the milk flowing from them freely; extra teats, indicative of good milking qualities, but should never be milked, as they draw the bag out of shape. Milk-veins large and swelling; milk excelling either in quantity or quality for making butter or cheese.

"10. [Skin of a medium thickness, movable and mellow; a white colour admissible, but a rich cream or orange much preferable. (We speak of a bare skin beneath the hair.) It is believed, as a rule, that cows with a cream-coloured skin yield the richest milk. Hair well covering the hide, soft and fine, and if under-coated with soft, thick fur in the winter, so much the better. Colour, pure white; red roan; bright red; red and white; spotted roan, or reddish yellow." The illustration in Fig. 55 is that of a Shorthorn cow of a first-class breed.

The following excellent description of the peculiarities of the Brittany cow is from Professor Gamgee's work on "Dairy Stock"—a work, we may add, likely to take, and worthy to maintain, a highly useful position in agricultural literature:—

"Standing from thirty-two to forty-two inches high at the period of maturity—viz., at four years of age—there is a remarkable symmetry of form; a short, fine head, with sharp outline, small muzzle, well-defined nostrils, quick, well-made eye, small ear, and slender horn, indicate the pure blood. The horns are well set, curving outwards and upwards, with the points turned to each other. In proportion as the horn is slender, is it prized by all judges of a Brittany cow. The colour of the horn is usually white at the root, and black towards the point; sometimes it is all black, or all of a yellowish colour; at others, but far more rarely, it is of a pure white throughout its whole length.

"The head is beautifully hung on a slender neck, which is well defined from the sharp outline of the jaws; the crest is free, and the dewlap very small.

"The body of the little animals is distinguished by a straight back, with well-formed withers; long and broad loins; prominent hips, indicating a large pelvic capacity, hence capabilities for bearing young. The rump is short, and the long tail is well attached, though the defect of the Ayrshire breed is sometimes seen from an elevation at the root of the tail, and a depression just at its apparent attachment. When the tail is thick

at the base, and elevated or outwardly attached, there are usually other defects of external form.

"The chest of the Brittany cow is wide and deep, with ribs well arched, and affording good room for internal organs.

"The limbs are very beautiful, with large fore-arms, though slightly muscular; short legs; joints small, but well defined; and the limbs, usually straight, are always tapering and slender. The hoofs are small, dry, and black.

"The skin is, in a good cow, invariably very fine and supple; the coat short and shiny; the colour is usually black and white; some, but very few, are all black, or with a white mark across the withers or croup, or along the back; the lower part of the belly is usually white; the muzzle is black, or black and white, rarely quite white; the roof of the mouth and tongue is always white. Some Brittany cows are red and white, and if a really good specimen of this colour can be met with, it is highly esteemed in France, and will realise a very heavy price; but usually the red and white Brittany cows are not so good as the black ones.

"The udder is generally well shaped, compact, though large for so small an animal, with teats pointing inwards. The mammary vein, commonly called the vessel, is large and flexuous. According to Guenon's system, every fine Brittany cow shows the typical points of a good milker, and usually belongs to the first class—that of the *flandrines*.

"A Brittany cow is capable of great endurance. She is active and strong, though always gentle and quiet. Hardy by nature, she thrives under any circumstances, and when well cared for and stall fed, fattens rapidly. She has, indeed, the greatest aptitude for laying on flesh so soon as the secretion of the milk is suspended. This should not be lost sight of by those who purchase these animals chiefly for the milk they yield. It will be found that, in proportion as they are allowed exercise when well fed, they will continue to give much milk."

Having decided on the breed of the dairy cow you purpose keeping, you must not omit to see that the particular animal you choose possesses all the *characteristics of a good milker*. The mere breed will not secure these. A cow is at its best paying time when it has had its second or third calf. It is important, therefore, in purchasing, to be sure of the age of the cow, and also to know her "note," as it is called; that is, when she had her last calf, or the date of her next calving. The appearance which the "milk-veins" present is another point. They run down on either side of the animal towards the udder; and if the animal is not fat, they are easily discovered by gentle pressure, and sometimes are so prominent that they can easily be seen. The appearance of the milk-veins should be taken along with the condition of the skin; this should feel soft and mellow to the touch, not hard, rough, and "staring," which always indicates an animal in poor condition. The appearance of the udder of the cow is also an important test. The udder should be full, swelling, and capacious, not "puckered up," to use an apt enough expression, under one part of the belly, but projecting well behind the legs, and also pretty well forward under the belly. The udder should feel soft and thin to the touch, not fleshy and thick, which latter attributes may give an appearance of fulness which it does not possess in reality. Be careful to see that the number of the teats on the udder is perfect, namely, four. If not perfect in her "quarters," as the technical word is, there is just a proportionate loss in the milk obtained; if one teat is absent, about a fourth less in quantity is the result. This arises from the fact that the udder is divided into four separate compartments, or "milk glands," each being supplied with its own teat. The udder is not, as has been observed, a barrel with four taps, by means of any one of which the whole contents can be withdrawn, but four separate vessels, each distinct from its neighbour, and each supplied with its tap. It is not only of importance that the "quarters," or teats, are complete, but it is necessary to see that

they are well placed on the udder—not closely set, but pretty far and equally apart—and are of uniform appearance. The eyes of the cow should be large, mild, and clear, docility of temper and quietness of disposition being very essential. Ill-temper and restlessness in a cow only brings about a loss of milk and general condition.

And here I would point out seven requisites to be attended to in the management of cows, which, neglected, will assuredly yield you nothing but care and disappointment:—*First*, regularity in feeding; *second*, regularity in milking; *third*, careful and *complete* milking; *fourth*, gentle treatment; *fifth*, regularity and completeness in cleaning both animal and stall; *sixth*, ventilation; *seventh*, a proper degree of warmth. On the first, fifth, sixth, and seventh, I have already, in the chapter on cattle feeding, somewhat largely dwelt. The importance of the second is obvious enough, but on the third and fourth I have a few words to say. Careful and *complete* milking, the udder must be completely emptied, for two important reasons—*first*, the milk last drawn is the richest and the best, the poorest is always drawn first, being at the bottom, as it were, of the milk glands, just as the worst milk is at the bottom of a basin, the cream being at the top. The "afterings," as the last milk is termed, is the richest. The *second* important reason for completely emptying the udder is, that if *not* done the cow will soon cease to give milk at all. Indeed, the method of incompletely milking her is that used to *make* a cow go dry before she is about to calve. No way so speedy and effectual, then, for drying a cow as incomplete milking. A first-rate and conscientious dairymaid at the head of an establishment where many cows are kept, knowing the importance of this, goes round after the helps have done milking, and by "stripping" each cow, *sees* that they are milked "clean;" or still more certainly to secure this essential in dairy-cow management, she takes off the "afterings" herself.

Therefore, have nothing to do with any one who is to look after the cows, unless he comes recommended to

you as thoroughly competent. If a man—in the north of England, men generally milk; in some districts to do this is considered derogatory by men, and the milking is given over to the females—however clever and well recommended for his general abilities, is not sure of being a good milker, or who says he *thinks* he could do it, or who could *soon* learn—it will be better to cease further negotiation. He is not the man for you; while he is learning to milk he may be spoiling your cow. Then, as to the fourth of the points I have enumerated, namely, "gentle treatment," be sure that your cow-man or dairymaid is of a kindly disposition. If you are in the habit—which you should be—of continually, in your spare moments, "knocking about the place," as your men will likely term it, you will very soon see what manner of assistants you have. I have known ill-tempered men wreak their miserable wrath upon the poor unoffending animals, by means of kicks and punches; or by an infinite variety of less obvious, but not the less annoying, habits tease and torment the animals till they get restless and excited, and, of course, they fall off in milking at once. Animals have their own special idiosyncrasies, and require, like their "noble masters," to be humoured and treated considerately; and it is astonishing how soon some men, as compared with others, will find out *how* a cow requires to be humoured.

Have your eyes about you when you go into the cow-house at feeding or milking time, you will soon be able to discover whether the cows are kindly treated. I have seen a cow almost caress one man, follow and obey him like a dog, which, with another man beside her, would show all the signs of restlessness and fear. I speak only the truth when I say that there is a vast deal of deliberate, and fiendish, I may add, cruelty exercised towards the animals of our farms throughout the country, by debased and brutal men; and not a little, I regret to say, done by peevish, cross-grained dairymaids. Let the master look to this; policy and his pocket as well as humanity demand it.

In the management of dairy-cattle there are two plans pursued—first, that in which the cows are more or less pastured; and, second, that in which they are wholly housed, or nearly so. Both systems have their able advocates. In the former method, where strictly pursued, the cows have access to the pasture-field daily throughout the year, for a shorter or longer period, according to the period of the year and other circumstances. The best old pastures should be kept for the cows, care being taken to secure them a "fresh bite" by changing them frequently. Some dairymen keep their cows out in all weathers; this is to be reprehended, as, for instance, in very hot weather, keeping them out only subjects them to the annoyance of insects, which, keeping them in a state of continual irritability, has a prejudicial influence on the yield of milk; on the other hand, keeping them out in extremely cold weather lessens also the produce of milk. In both of these cases, when housed, the cattle should be provided with cut food. Some dairymen keep their cows out in the pasture all night during summer, milking them in the yard; some, on the contrary, keep them in the house all night, supplied with food, milking them in the morning and turning them out to the pasture thereafter. When the pastures begin to fail, a supply of vetches, cabbages, &c. will be found of great use. Although generally thought to be almost immediately destroyed by frost, cabbages are really more hardy. I have found the "drum-head" or "cow" cabbage, and the "Swedenborgian" or "giant" cabbage, stand repeated and severe frosts. I have fed far into the winter with cabbages, cutting them in the field as required. When well *hearted*, I find the frost affects the outer or the two outer layers of leaves, but the heart is generally fresh and sound. The leaves of the "giant" cabbage seem to stand frost well. At Christmas time even I have had cabbages standing in the field, presenting, in spite of previous severe frosts, a very healthy appearance, and have had a supply of green food far on in the spring. In addition to the winter

food ordinarily used in dairy-cattle feeding, other substances, as oil-cake, bean-meal, &c., &c., are now being largely introduced. The use of these I shall shortly discuss. In summer even, in some cases, it is the practice to add to the grass-feed some feeding substance, as cake.

In the second method of keeping dairy-cows, in which they are wholly housed—"the soiling-system," as it is called—a much greater number of cows can be kept than when a regular pasturing is pursued. The great points to be observed in the "soiling" of dairy-cattle are—*first*, regularity in feeding; *second*, diversity of food employed; *third*, warmth; *fourth*, cleanliness; *fifth*, ventilation. *Regularity of feeding* is of the utmost importance; where this is not attended to, the animals, not being fed at the accustomed period, become restless and irritable, and this has a bad influence in the yield of milk. *Diversity of food* is also another important matter to be attended to. "If a cow always receives the same kind of food, the quantity of milk which she yields daily will gradually decrease; whereas when there is a frequent change of diet, it will increase, or be maintained at as high a pitch as she is capable of producing. With this object, therefore, the addition of 3 or 4 lbs. weight per day of crushed cake or linseed-meal will be found very useful in the case of house-fed cows, securing a diversity of diet as well as a kind of food naturally favourable to the production of milk. It is, in fact, the change of food more than even what is called 'a clean bite' which renders frequent shifting in the pasture so desirable."

I now proceed to notice a few methods of managing dairy-cattle as pursued by different authorities, from which my amateur reader may derive a variety of useful hints, as well as be prompted, perhaps, to try a few experiments himself to test their practicability in the dairy. Perhaps the most celebrated system—as it is undoubtedly the most scientific in its basis, is that introduced by Mr. Horsfall, and expounded in two elaborate essays in the *Journal of the Royal Agricul-*

tural Society of England. The system has a two-fold aim in view, namely, the increase of condition in the fattening of an animal and its milk-producing capacity. These Mr. Horsfall has abundantly proved are not incompatible; however much they clash with popular notions of some districts which maintain that, to be good milkers, cows must be wretchedly thin or in poor condition. "My food," says Mr. Horsfall, "for milch-cows, after having undergone various modifications, has for two seasons consisted of rape-cake 5 lbs., and bran 2 lbs., *for each cow*, mixed with a sufficient quantity of bean-straw, oat-straw, and shells of oats, in equal proportions—to supply them three times a day with as much as they will eat. The whole of the materials are moistened and blended together, and after being well steamed are given to the animals in a warm state. The attendant is allowed 1 lb. to 1½ lbs. per cow, according to circumstances, of bean-meal, which he is charged to give to each cow in proportion to the yield of milk, those in full milk getting 2 lbs. each per day, others but little: it is dry, and mixed with the steam food on its being dealt out separately; when this is eaten up, green food is given, consisting of cabbages from October to December, kohl-rabi till February, and mangold till grass time, with a view to nicety of flavour. I limit the supply of green food to 30 or 35 lbs. per day for each. After each feed 4 lbs. of meadow hay, or 12 lbs. per day, is given to each cow; they are allowed water twice a day to the extent they will drink . . . . During May my cows are turned out in a rich pasture, near the homestead; towards evening they are again housed for the night, when they are supplied with a mess of the steamed mixture, and a little hay each, morning and evening. During June, when the grasses are better grown, mown grass is given to them, instead of hay, and they are also allowed two feeds of steamed mixture. This treatment is continued till October, when they are again wholly housed."

In the food thus given by Mr. Horsfall the hay and roots yield what is necessary to maintain the animal in good condition: while the rape-cake, bran, and bean-meal supply the extra food required to keep up the supply of milk. Latterly, Mr. Horsfall has used a modified form of food—giving less hay; that is, in place of 12 lbs., 9 lbs.; and also less roots, that is, 28 lbs. in place of 36 lbs. per day. He at the same time increased the quantity of rape-cake from 5 lbs. to 6 lbs. per day, and added 1 lb. per day of bran, and also of malt-combs. This latter—which is the dried germinating sprouts of barley or malt—is rich in albuminous matter, and greatly aids the production of milk. I use it largely, and find it beneficial.

I tried Mr. Horsfall's system last winter for some time, and with marked economical results. I, however, substituted oil-cake, that is, linseed-cake, for the rape-cake, which I could not so readily or conveniently obtain.

The Rev. Mr. Pulleine, in a prize essay of the "Yorkshire Agricultural Society," details his system of feeding as follows:—"It is a good plan to take up cows as soon as the nights become cold—say the middle of October, as the white frosts which occur about that time cause them to run off their milk. They are turned out during the day till the middle of November if the weather keeps fine. From that period till May-day they are kept entirely in the house, except being turned out a few minutes every afternoon to water. They are milked at half-past five o'clock, morning and evening. As soon as the man who feeds them comes in the morning, the dung is all removed, and each cow has a feed of 28 lbs. of roots.

At	7 a.m.	..	7 lbs. of chopped hay.
,,	9 ,,	..	A pail of water with ½ lb. of bean-meal stirred into it.
,,	10 ,,	..	2 lbs. of linseed-cake.
,,	1 p.m.	..	7 lbs. of chopped hay.
,,	2 ,,	..	Turned out to water, and then 2 lbs. of bruised cake.
,,	5 ,,	..	28 lbs. of roots.
,,	8 ,,	..	7 lbs. of chopped hay.

On this system of management, five cows produced in seven weeks, from the 25th of March to the 10th of May, 191 rolls of butter, 24 ounces to the roll, equal to about 254 lbs., 16 ounces to the pound. To this must be added 154 quarts of new milk and 42 quarts of cream consumed in the house. The milk was not regularly measured, but averaged about 60 quarts per day."

From an article in the *Journal of Agriculture* I quote the following:—

"The state in which the food is given has also a great effect in the production of both milk and butter. We have observed more than once that the yield of butter and milk is never so great when we give cows boiled turnips, with beans boiled quite soft amongst them, as when they get the boiled turnips and the same weight of beans made into meal and mixed raw with them. Again, there is more milk and no taste of the turnip in it, when the turnips are pulped and mixed with cut straw or chaff, and fermented, than if the same weight of turnips are given whole and raw. In the *Journal d'Agriculture Pratique* we read a short notice on this subject by M. Lejeune, a director of the Agricultural school at Thourout, in Belgium. The facts he reports are not to be regarded as experiments instituted to test any theory, but are merely extracted from his accounts, and show the importance of attending to the mode in which their food is given to milk-cows. In February, 1855, the milk of eight cows was selected for experiment. The cows were fed in the following manner:—Each cow got per day 4·4 lbs. of meadow hay, 13·2 lbs. straw, 48 lbs. linseed-meal, 11·5 lbs. of beetroot, and a cooked mash, consisting of 55 lbs. of turnips, 27 lbs. of beetroot, 1·2 lb. linseed-meal, 3·2 lbs. of rape-cake, 1·1 lb. of grain dust, 1·1 lb. of mixed meal, about 1½ ounces of salt, and six gallons of water. From this very watery diet a large quantity of milk was obtained, 16 quarts of which gave 1 lb. of butter. In the month of February, 1856, the calculation was made from the milk of ten cows, eight of which were those with which the observations were

made in the previous year. The nutritive value of the food detailed above was calculated to be equivalent to upwards of 30 lbs. of good meadow hay per head. The food given in 1856 consisted of oat-straw, beetroot, the meal of rye, oats, and buckwheat, linseed-cake, rape-cake, and the dust of wheat or bran, given in such proportions as to make the equivalent value of the day's feed equal to a little more than 31 lbs. per head of hay. None of it was cooked, and the beetroot was reduced to small pieces and sprinkled over the meal. There was not the same quantity of milk, but the proportion of butter was much larger, being 2 lbs. of butter for every 20 quarts of milk. The cows, with the exception of the food, were managed in the same way in both years, and there were more newly-calved cows in 1855 than in 1856."

In or near towns the management of dairy cows has reference more to the quantity of milk produced than to its quality. To increase the quantity of milk, the succulency of the food rather than the amount of nutrition it contains is the point looked after, hence the use of brewer's grains, and the liquid refuse of distilleries.

Mr. Davy's Food for Cattle.—In the *Bath and West of England Society's Journal*, vol. v., new series, p. 314, an account is given of the food used by this gentleman at his farm near Truro, Cornwall. The food consists of a mixture of grated turnips and chaff-straw, in the proportion of 90 lbs. of the former to 7 lbs. of the latter, mixed in the following manner. "The grated turnips (swedes) are intimately mixed with the chaff in a bin sufficiently large to supply the cattle with one day's food. These ingredients are allowed to remain in the bin three days, during which time considerable fermentation, and, consequently, heat is produced in the mass, sufficient to cook the whole as if it had been submitted to the power of steam. We observed that an odour is emitted from the fermented mass similar to fresh brewer's grains, evidently the consequence of the saccharine matter evolved from the roots and chaff. . . . 97 *lbs. of this mixture is given to each*

animal, and 4 lbs. of linseed-cake per day, in the following manner :—

1st feed, 6 o'clock a.m., mixture of chaff and turnips.
2nd ,, 9 ,, ,, ,,
3rd ,, 12 noon, 4 lbs. of linseed-cake.
4th ,, 1 o'clock p.m., mixture.
5th ,, 4 ,, ,,

In addition to this about 3 lbs. of dry chaff is given during the evening."

The "fash," as it is sometimes called, that is, the tops of the roots, should be ate up by the pigs and cattle, as much of it as possible while fresh. I have sometimes used a large quantity by boiling it up with chopped hay. This cooked food is greedily devoured by the pigs; with the addition of bean-meal and malt-combs it makes an excellent food for the milch-cows. It is not a bad plan to mash a quantity of the cooked hay and turnip-tops, and place it in barrels, taking care to force it well down. Compactly placed in the barrels, it will keep a long time; salt should be added to the food.

CHAPTER XXVI.

BUTTER-MAKING AND SELLING.

Butter-making.—If I were asked what are the three essentials necessary to be attended to in order to secure success in dairy operations, I would say that the first is cleanliness. What the second? Cleanliness. What the third? Cleanliness—still cleanliness—cleanliness in everything and cleanliness of everything. Borrowing Mortimer's idea, it would pay, I believe, if we could have caged starlings in our dairies, calling out perpetually in the dairymaid's ears—cleanliness! I do feel inclined to attribute many of the mistakes and misfortunes met with in amateur dairies to the want of attention to *complete* cleanliness. I once heard as thorough a housewife as ever had a true claim to the name remark, that she could get plenty of servants as surface-cleaners; but what she liked to see was the dirt "bottomed." Now there may be plenty of surface-cleaning in dairies; but, unless everything is so cleaned that the dirt is "bottomed," the work has no right to be considered finished: and finished cleanliness is what *must* be attended to in a dairy if the produce is wanted of good first-rate quality. To produce thorough cleanliness in vessels used in the dairy, they must all be well "scalded" after being washed. Now, the reader will please to bear in mind, that "scalding" implies the use of *boiling-water*—but not warm merely—scalding hot as fire can make it. I have seen water used for "scalding" so called, that would scarcely have warmed the tip of an infant's finger—hot! why Bardolph's nose smelling at cold water would nearly have made it

as warm. Let the water, then, used for the scalding of dairy utensils be neither more nor less than boiling when it is used. Before scalding, however, the following is what is done in my dairy:—The dishes or vessels which have had milk in them are first rinsed with a small quantity of *cold* water, the rinsings being added to the hog-wash; they are next washed with a larger quantity of cold water, the *dairy dish-cloth* being used. I have italicised the "dairy *dish-cloth*" to indicate that it must be used for dairy purposes *only*, and for no other purpose whatever. All other usage of it will be a desecration of the dairy.

Milk or cream set aside in the dairy dishes is a most delicate thing, and has a wonderful aptitude for absorbing quickly taints of all kinds. Everything, then, must be kept out of the dairy which would have a tendency to putrefy, or to render the air foul. I have known the odour from a milk-spot left on the table to taint the milk in a vessel near it. Let all such milk-droppings be washed carefully away, and the spots thoroughly *scalded*.

In making butter there are two methods of working—first, by churning the "whole milk," and secondly, by churning the "cream" only. Each system has its advocates; the experience of my little dairy, as it is promulgated by its oracle, is decidedly in favour of churning the cream. The *modus operandi* is as follows:—

An average proportion of cream obtained from milk is one quart of cream from twelve quarts of milk—this ought to produce one pound of butter. The milk as it is brought from the cow-house is strained through a "sieve" into the milk-pans or dishes, which, in my dairy, are of glazed earthenware. The dishes are then set aside for the cream to rise—this morning's milk, as it were, being creamed to-morrow morning. The cream obtained is put in a deep cream-mug, also of glazed earthenware. Note here, good reader, that your dairy-maid *must* put the cream into the mugs carefully. For why? If thrown in hurriedly, the cream dashes up on

the sides of the mug, and drying there, putrefies or acquires a bad taint. As successive portions of cream are put into the mug, the advancing tide, so to speak, covers these islands of clotted, rancid cream, and it is then communicated to the mass of cream, and bad butter is the result. The one solitary instance, in our dairy experience, when we had bad butter, it arose from this cause. As we milk our cows every morning and evening, so we cream the milk every morning and evening; thus early morn and dewy eve finds our dairymaid adding to the store of cream in the cream-mugs. As each addition is to be made carefully, so is it equally necessary that *when* the addition has been made, that the whole be well stirred with a cream-stick or a wooden spoon. This spoon or stick should be allowed to remain *in* the cream. This stirring of the contents of the cream-mug is absolutely essential when additions are made to it. The best and richest of the cream rises to the top; if when new cream is added to the mug this is not stirred up, the contents of the mug become rancid and exceedingly nasty, and the *result is, the butter is sure to be bad.*

The cream is thus collected for a few days—the collecting process being extended over a longer period in winter than in summer. In winter, for instance, the cream may be collected—that is, portions added morning and night in the manner above detailed—for a full week; in summer from four to five days, according to the temperature. The collection being finished so far as one mug or a set of mugs is concerned, the contents of this or these are allowed to remain for a few days till sour and thick—that is, till it is "ripe," or "cauved," as a provincial term has it. While souring, the stirring twice or thrice a day is essential.

When "sour," "ripe," or "cauved," the contents of the mug or mugs are then ready for churning. Pray do not let this process frighten you, for nothing can be easier or simpler if you have followed to the letter the directions I have given above. I know a lady who had no experience whatever to fall back upon, nothing but

natural *nous* and mother-wit and readiness to aid her, who commenced butter-making, and carried these directions out, and who never had a failure; but from first to last, over a period of fifteen months, churned with ease and pleasure. By the way, I ought to state, that the lady above referred to *had*, in churning, some slight experience—with a quart pickle-bottle—a strange implement enough in all verity; yet, notwithstanding, if any one wishes to ascertain the real *rationale* of the churning process, let him shake cream about in a clean *quart* pickle-bottle, and he will learn more from it than from a long and patient perusal of a load of agricultural treatises: you *see* the process through the clear glass. One has read appalling accounts of the difficulties to be encountered in the process of churning, of folks hard at work for hours, some for a whole day, and, alas, no butter as the result of the labour. In our little dairy such hard experiences have not fallen to our lot.

The following, taken from the butter-making book —see next chapter—will show how easy, as regards the time taken, has been on the average of the churnings: —twelve minutes, ten minutes, half an hour, three-quarters of an hour, one hour and a quarter, one hour and a half, two hours, one hour, half an hour, and so on. The longest time ever taken being three and a half hours; and that happened in consequence of having filled the churn too full, so that it had to be divided and the quantity churned twice; this, in point of fact, reducing the time of each churning to one hour and three-quarters. The time for churning the whole quantity was, of course, entered in the book. The churn we use is that known as the "American churn;" the agents are Messrs. Burgess and Key, of Newgate Street, London, and I had mine supplied me, along with the few implements I required, by Messrs. Richmond and Chandler, of Salford and Liverpool. This churn is of the box or dasher kind. In winter, if the butter is long in forming, it is a good plan to put a little warm water into the churn, stirring it up with the dasher. Before putting the cream into the churn, it should be

well scalded with boiling water; in winter, the cream is put in while the churn is hot; in summer, the hot water is allowed to remain in the churn till it has cooled. The churning is carried on rather quickly at the first, till the cream is broken, when the speed is reduced, and the working is continued till the butter is formed. As the butter forms or "comes" in small particles, the "collecting" of it is the final operation. This is bringing the small particles into the form of a large lump, or longish lumps; and this is done by moving the dasher slowly backward and forward, say, a quarter of its entire revolution—*not entirely* round.

The *making-up* of the butter tests the neatness of the dairymaid. The butter is lifted out of the churn and placed in the wooden butter-basin, in which is a supply of "fair spring-water." With the hand it is there worked and washed, the water being from time to time renewed, till all the milk is washed out of the butter. It is then salted to the taste—if your taste be mine, reader, let your dairymaid sprinkle the salt with a light rather than a lavish hand; the salt, in whatever quantity decided on—I keep in view here, the temptation, in the salt line, to avaricious dairy folks, salt being so much cheaper per pound than butter—is then worked well and equally in by hand. I say equally, for in this the skill of the maid is shown, for what more atrocious than to eat butter with lumps of salt here and there in it. I have omitted to say anything about the colouring process. If colour is required, the annatto is put into the churn along with the cream. Colouring we have never had occasion to resort to, the natural rich appearance of the butter of our dairy pleasing even the most fastidious of our customers.

CHAPTER XXVII.

CHEESE AND CHEESE-MAKING.

So far as this product is concerned my little farm yielded no lessons, or but the scantiest number, having made such limited quantities only as served more by way of amusement or of limited experiments. So far as the experience of our little dairy went, however, it sufficed to make it clear enough that there would have been practically no difficulty in adding this produce to those of the farm had circumstances created a demand for it. In one, and in the general sense, it is an easy thing to make cheese, provided one has not only all the necessary appliances, but, what is of greater importance, good milk to make it from; for we even made cheese with the very simplest dairy implements and appliances. But it is another thing to make it of the well-defined and known flavour, to make it have the physical or mechanical peculiarities which are the accompaniment of any particular flavour, and, at the same time, needful to please the "dealers," or customer. As this edition of our work is designed to address a wider range of readers than did the first issue, it is considered necessary that we should give at least as much information in cheese-making as will suffice to enable the small farmer to make it of a good quality, leaving him, by the experience of repeated makings, to learn how to please dealers and customers, should he make this department one of the mainstays of his little establishment.

Of the large number who almost daily partake of cheese at one at least of their meals, and who are not

connected with farming, but an exceedingly small proportion have any idea how it is made. Some there are, indeed, whose ignorance extends to such a point that they do not know what are its chief constituents, while if the majority do go beyond this stage, they know, nevertheless, but little of the way in which the liquid milk and cream they use with their tea or coffee are transformed into the solid cheese they cut up at the dinner or supper table. It will serve to convey at least a fair idea of the way in which this transformation is effected if we give here the following general description of cheese-making; and indeed we hope it will do more than this, as the points detailed are all thoroughly practical.

The appliances, or apparatus, may be of the simplest character, in order to make what may be called our elementary or "lesson" cheese: a pot or pan, a small tub, a jug or two, a basin, and a kitchen muslin strainer. With the exception of the bath thermometer—and even this in a house having a bath will be no exception—and the long batten or wooden lever, it will be noticed that all these appliances can be got together out of the ordinary kitchen furnishing of a house; a cloth, a sharp-pointed knife, a bath thermometer, a hoop of metal or of wood, and a long batten or lever, complete the cheese-making apparatus and appliances. The time and way in which these appliances are to be used will be seen as we proceed in our description of the process. "First catch your hare," says the well-known authoress of a Cookery Book, in giving a receipt for hare soup; and, availing ourselves of the time-honoured joke, we make it again do service in a new direction, and say to the learner or student in cheese-making, "first *get your milk.*" This will be found in these enlightened times in which we live, not to be quite so easy a thing to be done as one would suppose; to paraphrase a well-known French saying, "There is milk *and* milk," some of it which ought to come, and often does come, under the operation of the Adulteration of Foods Act, and which is not fit; some which *is* fit for making a good cheese. It is

this alone which ought to be used, as we presume that the learner in the school of cheese-making wishes to have his or her products of the best only. Second in importance to having good milk, is the having all the appliances we have named, and indeed everything in and about the cheese-making place—and need we say the cheese-maker's person and clothing—in a state of absolutely perfect cleanliness and purity. We have said that this is second, it is, in fact, of equal if not greater importance than having good milk to operate upon.

In a clean pan—an enamel-lined or a preserve-making pan will do famously—put the clean and good new milk, and heat it till it arrives at a temperature of about 85 degrees. Some make a great fuss about the exact heat to which the milk should be warmed; in fact it will be none the worse if it be what housewives call scalded, but not burnt so as to have a smack of the "bishop's foot," which would utterly spoil the flavour of the cheese. The milk thus heated is to be strained through the strainer placed over the wooden tub, which must be of that most dazzling purity of cleanliness which would satisfy a "fat frow" in Holland. And now comes the first step towards making the liquid milk into the solid form. This is effected at this stage by mixing with the milk, which is supposed to be now so far reduced in temperature as to be about 85 degrees, or less, a solution of "rennet;" this must be thoroughly mixed with the milk, and then the whole covered over with a cloth till a later stage of the process is reached. While we are waiting for this, let us use the time by giving a word or two about this same "rennet." It is a product, if we may use the term, of a certain part of the stomach of a calf, which is washed clean, then thoroughly well salted, dried, and stored away for future use. When about to be used, or rather some few days before this, the "bag," as it is called, or part of it, according to the cheese to be made, is soaked in warmish water, rubbed and worked in it, and allowed to lie till the strength of the bag is pretty well imparted

to the water; some add salt to form a brine, but usually the bags are so completely saturated with salt that this will not be necessary. The management of the rennet and the proportion to be used are, however, points which experience can alone, or at least best and most safely, impart to the cheese-maker, and belong to that category of things to be done which cannot well be taught through the medium of books. Prepared rennet may be bought at shops, as also substitutes for it, of which pepsine is, perhaps, the best; but the best is poor compared with the rennet. Chemically or scientifically little is known as to the mode of action of rennet. It is the only substance we possess which can do precisely and what it alone does, which is, to coagulate the warm milk with which it is mixed in right proportions; or, *in popular phrase, to form the liquid into a semi-solid*, semi-liquid substance called "curd."

At this stage we suppose the milk in the tub with its close cover to be transformed into this same curd. The cover being removed, the curd in the tub is to be cut into slices by parallel lines, these are to be crossed by other cuts parallel to one another, the result of the two being that the curd, to its full depth or thickness in the tub, will be divided into a series of squares some half-inch on the side, or at the most a little over. The best state of the curd to be in for cutting is seen by passing the finger through the surface for a short distance. If the curd splits and keeps opening up regularly before the finger, it is in good state to be cut. The cutting must be neatly and deftly done, so that the squares should have smooth and not rugged edges. As the cutting proceeds a liquid will flow out from the curd of a bluish tint; this is "whey," about which, and the uses made of it, we shall have hereafter a word or two to say. When the cutting of the curd is completed, cover up the whole with a cloth as before, and allow it to remain at rest for a time. After a longer or shorter period seen to be necessary, take off the cloth, and if the whey has accumulated so as to form a bath of liquid equal to, say, about a tenth of the whole bulk of

materials in the tub, strain or take gently off the whey which is floating on the top of the curd.

The next process is the mixing and crumbling of the curd, so as to bring it into a finely-pulverised condition fitted for the final process. The next thing, therefore, to do, is to warm part of the whey which has been removed from the curd as above stated, till it has a temperature of about 120° or 125°; at this heat it is to be poured back into the tub, upon the curd, and the whole is then to be mixed and worked by hand, taking the curd up in handfuls, crumbling it and thoroughly mixing it with the whey till the temperature is reduced some twenty degrees lower than the whey when first put in. This mixing, crumbling, or stirring, by whatever name it may be called, requires to be done with the greatest care. It is indeed that part of the operation of cheese-making upon which depends the value of the produce; for upon the right and the wrong doing of it depends the fact whether the cream shall be retained in the curd and therefore in the ultimate cheese, or passed into the whey; and upon the presence or non-presence of the cream depends the richness or the reverse of the cheese. In regularly appointed dairies there is a machine used to break and mix the curd; this of course does it more uniformly than it can be done by hand; but some dairymaids prefer the hand, in which there is a delicacy of touch which no machine can equal. The great point is to have the curd broken as uniformly as possible, and so that the particles will not adhere or clog together.

When well broken the curd looks very much like a heap of good-sized sago or tapioca in the uncooked state. When the first mixing is done, the tub is to be covered with a cloth till the "curd granules," as they may be called, are uniformly warmed through, the remainder of the whey is to be heated and added to and mixed with the curd as before, the curd granules getting finer and finer and harder as the mixing is gone through, and the less tendency will they have to adhere or clog together. To allow the curd to ripen,

as it is termed, so as to be fitted for the next stage, it should be covered with a cloth and allowed to remain in the tub for some time. It is known to be ripe when some of the granules of curd crumble if taken up, squeezed together, and applied to a hot iron, are drawn *into fine threads when pulled away from contact with* it. The required heat of the iron is that which makes water bubble and simmer when put into a vessel containing it.

When ripe, the whey is next to be drained off from the curd in the tub, and the curd to be taken out and placed on a strainer to be dried or drained. When this is accomplished thoroughly, the curd is next to be salted. The degree of salting is of course a matter of taste, but as a guide for average use, about 3 lbs. of salt may be given to each 100 lbs. of curd.

Now comes the time to use the hoop and the long batten, or lever. The hoop is that which gives to the curd solidity and the well-known circular or disc-shaped form of cheeses in this country, with one or two exceptions, as the cylindrical shape of the Stilton, for *example.*

The hoop is placed on a clean table, and a clean cloth placed inside; this cloth must be large enough to fall over the edges of the hoop, and to cover the upper face of the curd when placed and pressed into the hoop. On the top of the cloth a wood disc or flat circular piece is placed; and thus prepared, the whole is put under pressure. The pressure in the simplest way is obtained by the long batten, one end being inserted in a hole in the wall, or in a wooden upright or post, while the other end is loaded with heavy weights, the hoop, &c. being placed between them. At first the pressure should be very gentle, and applied for, say, six hours, till the curd granules have adhered well together. The lump, or cheese—for it is now a cheese although only partially made—is now to be taken out of the hoop or mould, for such it really is, and reversed in position, a clean and fresh cloth being placed, as before, with the flat wood disc, and then the whole put under the lever pressure,

which should be increased by heavier weights at the outer end. Kept under there for a day or so, the cheese is ready for the last stage of all, "the ripening." This is generally carried on in a separate room, having an equable temperature, the cheeses being regularly turned over as they lie upon the shelves, which are best made of latticed work, to admit a current of air all round them.

CHAPTER XXVIII.

CROPS TO BE CULTIVATED SUITABLE FOR DAIRY-CATTLE FEEDING.—THE SOILING-IN HOUSE-FEEDING SYSTEM.

THE experience of the best authorities in the management of dairy-cattle is, that the higher and more careful the system of feeding adopted, the less the expense and the greater the produce. Hence the advantage of arranging part of a dairy-farm for arable culture, to rear a succession of crops useful for feeding, as turnips, kohl-rabi, cabbages, rape, vetches, &c., and also of the method of purchasing and using foreign foods, as oil-cake, rape-cake, and the like. On the subject of the course of cropping to be adopted, the following, from the *Irish Farmers Gazette*, will be of utility:—

"The green crop break will furnish cabbages for use in autumn and beginning of winter, with turnips and mangolds for consumption during winter and spring. With the grain crop which succeeds there will be sown Italian rye-grass and clover; and as a varied supply of summer food is requisite, one-half of the break need only be sown with 'seeds,' the remaining half being reserved for winter and spring vetches—the former being sown in September after the wheat stubble, and the latter in successional sowings during the spring months. The winter vetches being early ready for use, will allow of turnips being sown on their removal. The summer keep of the cows consists, therefore, of the different sowings of vetches, and, according to the richness of the land or the manurial applications resorted

food be anticipated, the limits of this cereal crop may be trenched upon by reserving a portion of the land previously under rye-grass and clover for the production of spring-sown vetches."

When the soiling, or house-feeding, system—of which several remarks will be found in our earlier chapters—is carried out, no mode of culture and management seems more worthy of adoption, and is nowhere, certainly, so fully and clearly explained as in an American work, recently published, on cattle-soiling, by Josiah Quincey. The following cannot but be useful and interesting to the reader:—

"As to 'my practice' in soiling, it relates, *first*, to the quantity of land to be cultivated for the purpose of preparing succulent food; *second*, to the particular articles to be thus cultivated; and *third*, to the times they are to be sown, so as to effect a regular succession of such food.

"1. As to the quantity of land to be cultivated. According to my experience, *one square rod of land* of rich loam, in high tilth, in grass, oats, barley, or Indian corn, is enough for the support of a cow a day, if cut and delivered to her in the barn. As, however, there is a great difference in the state of land and its productive power, and as it is important there should be no failure in succulent food, my practice has been to cultivate *one and a half square rods* of land per day for each head of cattle I intend to 'soil,' and, on this basis I make my calculations in the spring of the year. To make this calculation sufficiently exact, the length of time it will take the article sown to come to maturity so as to be fit to cut, and the length of time it will afterwards continue succulent, are to be considered. The time it comes to such a state of maturity is, of course, the time at which it may be relied upon for 'soiling.' A like reliance may be placed on the time it will continue succulent. The general knowledge of practical farmers, and experience, will easily give information on both points.

"If any article sown in the spring will come to

maturity on the first of July, and will continue succulent *ten* days, fifteen square rods of succulent food will be wanted for each cow 'soiled.' *One* cow will, therefore, consume fifteen square rods during that period; and cows will require one hundred and sixty rods, or about ten an acre, of such food for their support. On this calculation I have safely 'soiled' from *thirty* to *thirty-five* head of cattle, adding an acre of preparation for every ten head.

"Should any one, however, adopt this practice for the first time, I should advise the preparing *two square rods* for each cow, to guard against every contingency to which a first attempt may be liable, for nothing will be lost, if the food should be proved more than was required. The surplus becomes a resource for the winter keeping after it is too rank for 'soiling.'

"2. As to the particular articles to be thus cultivated, I have tried many besides those above mentioned; such as millet, lucern, cabbages, peas, the tops of carrots, beets, or turnips. Each may be usefully applied in its proper season, particularly the three last. And whoever keeps milch-cows will find roots an important auxiliary for milk in the winter season; and, of course, will find their tops an important aid to 'soiling' in the latter months of autumn. But I think it best to enumerate only the fewest, the simplest, and the best known to all farmers, of the articles which, from experience, I have found the surest and the best to be relied upon for a successful conduct of the system. These are those already enumerated — oats, barley, Indian corn, sown broadcast or in drills, for fodder.

"3. The time at which the above articles are to be sown.—The usual period in this country for turning out cows to pasture is from the 20th of May to the 1st of June. Antecedent to this period, no succulent food can be obtained for 'soiling.' Preparation, however, may be made the autumn previous by sowing winter rye, according to the proportion required for 'soiling,' from the 10th or 15th of the month of May to the 1st of June. This could be done with advantage; but I

have never practised it more than once, because, although I have always had rye fit for cutting at this time, yet it is too valuable, as grain and straw, for me to use it, regarding, as I do, winter rye, at the usual prices of *grain and straw in this vicinity*, to be most profitable of any grain product.

"The reliance in the 'soiling' system, for succulent food, between the 20th of May and the 1st of July, is *grass*, cut and delivered in the stable; and, according to my experience, one and a half square rods per day for each cow 'soiled' is ample for this purpose. The grass thus cut was usually that which is the least likely to be preferable for winter keep; such as that growing by the side of my farm roads, or under trees, or that having the rankest fibre.

"The food sown and cultivated for 'soiling' in this climate must have exclusive reference to the summer and autumn months, commencing with the 1st of July. And the following is the order of sowing, according to my practice, justified by experience; the proportion of land sowed at each successive period being, as above stated, *one and a half or two square rods per day for each cow soiled.* To produce a sufficient quantity in succession of succulent food, sow—

"1. As early in April as the state of the land will permit—which is usually between the 5th and the 10th—on properly prepared land, oats, at the rate of four bushels to the acre.

"2. About the 20th of the same month, sow either oats or barley, at the same rate per acre, in like quantity and proportions.

"3. Early in May, sow, in like manner, either of the above grains.

"4. Between the 10th and 16th of May, sow Indian corn (the flat, southern being the best), in drills, three bushels to the acre, in like quantity and proportions.

"5. About the 25th of May sow corn in like quantity and proportions.

"6. About the 5th of June repeat the sowing of

"7. After the last-mentioned sowing, barley should be sown in the before-stated quantity and proportions in succession, on the 15th and 25th of June, and on the 1st of or early in July: barley being the best qualified to resist the early frosts.

"The results of the above sowing in succulent food may be expected to be as follows, seasons of extraordinary drought excepted:—

"The oats sowed early in April will be ready to cut, for 'soiling,' between the 1st and 5th of July, and will usually remain succulent until the 12th or 15th of this month.

"Those sowed about the 20th of April will be ready to cut between the 15th and 20th of July, and will last nearly, or quite, till the 1st of August.

"Those sowed early in May will be ready to succeed the preceding, and last till about the 10th of this month. The corn sown on the 10th and 25th of May, and early in June, will supply, in succession, succulent food of the best quality until early in September.

"The barley sown in July will continue a sufficient supply until early in November; at which time, and often before, the tops of roots, carrots, beets, or turnips are a never-failing resource."

CHAPTER XXIX.

MACHINES FOR PREPARING CATTLE-FOOD.—DAIRY IMPLEMENTS AND UTENSILS.

THE machines required on a small farm for the preparation of the food are few in number. An important one is the *Straw* or *Chaff-cutter*, as it is generally called; a well-known one manufactured by Messrs. Richmond and Chandler. In Fig. 56 a front view of this chaff-cutter is given, and in Fig. 57 a view of a smaller size.

Fig. 56.

Fig. 57.

A very simple form of *Turnip-cutter* is shown in Fig. 56. This will do well enough where one or two cows are kept; where the number is greater a machine capable of doing more work, such as Hunt and Tawell's Root-cutter, will be essential. Where it is desired to pulp the root, Bentall's Root-pulper will be found efficient.

Where beans or oats are used, they should be crushed

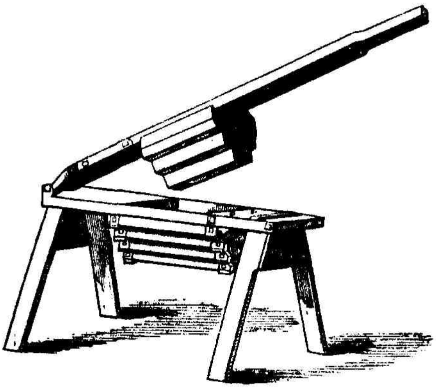


Fig. 58.

or bruised. A well-known form is the Bean-crusher of

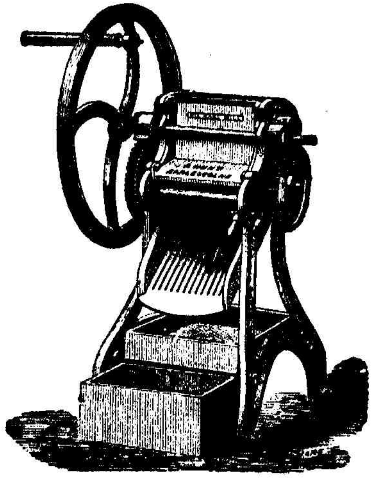


Fig. 59.

Messrs. Hunt and Tawell, of Earls Colne. Richmond

and Chandler's Oat-crusher will be found efficient. One of Whitmee's Flour-mills for grinding wheat, beans, &c. for cattle-food will also be found very serviceable on the small farm. Where oil-cake is much used, an Oilcake-breaker will be found useful; a well-known form is illustrated in Fig. 59.

Dairy Implements and Utensils.—The principal implements and utensils which I employ are illustrated

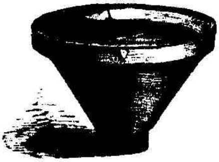


Fig. 60.

Fig. 61.

below. It is needless to take up space in describing them; it will be enough to state that the form of churn know as Anthony's American Churn, enjoys an ex-

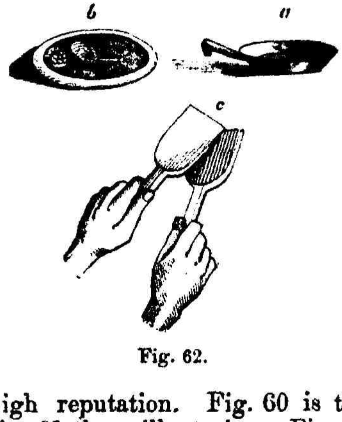


Fig. 62.

ceedingly high reputation. Fig. 60 is the milk-pan or basin; Fig. 61 the milk-strainer; Fig. 62 *a*, cream-skimmer; Fig. 63 the cream-mug; Fig. 64 the butter-bowl, for working or making the butter in; Fig. 62 *c*

represents the "butter-sticks." By these, after a little practice, the butter can be worked up into a variety of neat and fantastic shapes, ready for the table. Some of these are shown at Fig. 62 *b*.

Fig. 63.

Fig. 64.

Of late, machines and appliances for large dairies of a more or less complicated character have been introduced into practice—such as milk-coolers, cream-raising machines, and the like; but these, alike from their nature and cost, are quite beyond the means of the small farmer, although the amateur farmer may, if he chooses, indulge in the somewhat expensive luxury of having them in his dairy. For his amateur work he will, I fear, find them out of place.

CHAPTER XXX.

THE POULTRY OF THE SMALL FARM.

WHILE dairy-cattle and a horse or two are the live-stock of the amateur farmer, to which the gentlemen deem it worthy to pay attention, the poultry come under the department of the ladies of the house—that is if they have rural or farming proclivities, and are not too high in station or too grand to see personally that they are furnished with a dry-house and suitable provisions—engross their care, and very speedily become the objects of their affection, and are raised to the first rank of pets of the farm. Nor is this to be at all wondered at—it is not every lady who can feel confidence on a horse, however kindly they may think of them and be disposed towards them; and very few ladies indeed there are who have feelings other than those of cowering dread or fear, and something like aversion, to cows. But poultry are such "tiny things," so lively in their ways, require no hard labour in feeding or attending to them, and have so many of what may be called the "family ways," that they are easily made "family pets."

We have in this section of our little work been taking the live stock of the small farm-yard on what may be called the descending scale, beginning with the largest and ending with the smallest of them all. We thus class poultry as "live stock" of the farm-yard, although, no doubt, many a farmer will decidedly object to classing them as stock at all. For with those the prejudice against them is so strong, that although they will condescend to eat them at table, they will not

condescend to give such care to them as will render them all the more fitting food for it—plump, fat, and juicy in flesh. Yet there are some of our farmers, and eminent ones too, who take a broader, juster, and decidedly more accurate view of the matter, and although they may not classify or call them stock—a trifle indeed—they do take pains to keep the best birds, and give some time—or, what is the next best thing, allow their servants to give it for them—to see that their food and lodging are of the best materials, and all properly looked after. One, not the least advanced of our farmers, has well observed that if a good return for the money expended be the object of keeping any class of live stock, he does not see why poultry should be made an exception, for they have much to be said in their favour as producers of food.

Weight for weight, and taking that and the value of the food with which they are supplied, they compare favourably with any "live stock" of the farm. Averaging the price obtained for beef and mutton at 4d. or 5d., or even so high as 6d. per pound, we find the average price obtained for poultry, as meat, is 9d. or 10d., and in some seasons higher than this; while as for the eggs, they at times bring in prices to the poultry rearer which appear very high even in rich districts. The wealthy people buy, apparently determined to have them at any price. Fowls have not only little "offal" to reduce the amount obtained from the butcher—we should say the poulterer—but a large portion of their food costs the farmer nothing, and comparatively little care is demanded in their breeding and rearing. Here, compared with the "big beasts," which bring such big prices at cattle shows and markets, fowls are but "small game," indeed, for farmers to aim at or trouble themselves with. Yet, if figures are to be acted on—although it is said that they can be got up to prove anything; a fact which if true, however, applies equally to other live stock—the importance of fowl-farming is shown by the aggregate amount which it produces, an amount even in this country which assumes somewhat gigantic

proportions, proving that great effects often rise from very small causes. We say even in this country, for compared with what is done on the Continent in fowl-farming, we do, so to say, nothing. The number of eggs, for example, imported into this country from France was half a million of millions, or 500,000,000,000, the pecuniary value of which must have been no trifle, seeing it is set down at £2,000,000 sterling. This was but three years ago; we have no later statistics; but there is no doubt that with the increased demand for produce of this kind the number is now much greater than the above, enormous as that is. A department of farm production which can spare to send to another country what represents a sum so vast as £2,000,000 is surely no mean one, and can scarcely be said to be beyond or beneath the notice of our own farmers. We believe that large as is the amount obtained by those of France from poultry, it is gained by a most trifling expense, inasmuch, as a rule, they give little or no special food to them. The figures we have given refer to France alone, and take no account of Belgium, Holland, and the villages on the Rhine, all of which contribute their quota to swell the aggregate of produce of this kind imported into this country, to make up a deficiency caused by the indifference of our farmers, especially of our small farmers and of our cottagers, to a source of income which, in view of the trade done, cannot possibly be a trifling one. There can be no doubt that both small farmers and cottagers could make poultry pay, and that to a very satisfactory degree; and this by no greater amount, if so much, of care and labour than they give readily to other departments, some of which do not pay so well.

Every amateur farm must, of course, have its poultry department carefully fitted up and well attended to. Some amateurs will make this *the* department of the farm, bending everything to it, and giving it a prominence which no other will get; others, again, will pay it the due share of attention, but allow it to usurp no place over any of the others, letting it be looked after,

in fact, as one of many departments, not as the one. I confess to belong to this latter class. I had no claim to be considered as a "poultry fancier;" my stock was more remarkable for the number and variety than for the purity of the breeds. Doubtless, high authority—as "The Henwife," for instance—would be inclined to deny that my poultry were worthy, in any way, of the title; and I am free to confess that, compared with the well-disciplined and carefully collected army of her lot, mine might rank as did Falstaff's regiment, which even Falstaff would be ashamed to own. "I would not march through Coventry with them, that's flat." Possibly a poultry-fancier would say that Coventry was precisely the place to which my poultry should have been sent.

When I say that my numerous army of poultry was composed chiefly of all the "mixty-maxty" ragamuffin kinds known as barn-door fowls, I know that I at once put myself out of court, and lose, henceforth, all right and title to be considered a keeper of "poultry." Yet, nevertheless, when I looked at my restless, scraping, crowing, crooning, cackling lot, it reminded me of the story told of a poor woman, who having had the misfortune to go into a church-pew which was *not* on the poor side, and who was turned out by the apparitor with more roughness of gesture and graphic force of speech than befitted the place—"Get out o' that, you ugly hag!" was met by the retort, "Well, if I am ugly, I am godly." So with my poor lot of hens, I am free to admit that they were ugly and beggarly-looking, but somehow the "beggars" laid well, and brought-up decently, in some sort of way, respectable families, which looked well and which sold well also. And *that* was surely something. The truth is that, however pure the breeds may be with which you start, unless the greatest possible pains is taken, the purity soon ceases to exist. This pains I did not care to take; moreover, I sheltered myself, as I do still, under the wing—the simile is allowable in a chapter on poultry—of one of the ablest agriculturists, who gives it as his opinion that for ordinary farmhouse

purposes the "barn-door fowl" is the best, both for laying and for the purposes of the table. The poorest-looking hen I had was the best layer. It is, I guess, in the poultry as it is in the lady world, the finest-looking is not always the best. Nevertheless, poultry possess their "points," and those should be attended to.

There are two lessons which the attentive amateur farmer will soon learn from his poultry; these are, that to make them pay, good housing and good feeding must be attended to, be their "points" what they may. The house should be well built and warm, and have, if possible, a southern or south-west exposure. Light and ventilation should be attended to. The floor should not be of rough stones or brick, but of some soft, elastic material, as clay or gravel, well beaten down. An authority in poultry matters states it as his belief that cold hard floors are the cause, in nine cases out of ten, of cramp in fowls. The yard attached to the house should be kept supplied with a dust-bath; that is, a box or hole in the ground filled with coal or wood ashes, or dry sand and lime. The form and position of the perch is a matter of great importance. In many a poultry-house you will see the perches of bars of wood some inch and a half in diameter, as carefully planed and rounded as if the point to be attained was the having small and smooth perches; whereas, on the contrary, the perch should be rough, and not round—rather square than round—and pretty large. Mrs. Blair, the great modern authority on poultry, recommends movable perches in the form of "trestles," some two feet high from the ground; these are made of split larch, with the rounded and rough-barked side uppermost. The cylindrical, smooth-surfaced bar, as a perch, is denounced by Mrs. Blair. "The fowls cannot take a firm hold on it; and, besides, it is certain to cause crooked breastbones—a grave defect." But the position of the perch is also of moment. Mrs. Blair recommends them to be placed low, about two feet from the ground; others, again, think they should be high. Certainly, arguing from the original habits of the bird, high

perches are likely to be the best, roosting in trees being their habit; certainly hens are exceedingly fond of getting to the highest possible place in the house to roost in. I kept a lot of fowls one season in a stable, which was otherwise unoccupied, and I was often highly amused to hear the noise made, and to watch the bickerings carried on by the hens in the attempts they make to obtain the highest perch. It takes, generally, poultry no small time in the evening to settle down.

The second lesson which poultry on a farm teach, is the necessity there is of good feeding being attended to. Scanty food, little good! is just as worthy of being remembered in the care of poultry as in other stock of the farm. "Never stint poultry in the variety or quantity of the food. Good food is a positive economy." Such are the deliverances of a high authority on this point, and, I believe, they are indisputable. If it does not pay to keep them well, it never will pay to keep—if this term here is not indeed a misnomer—them ill. Better kill or sell than half-starve. Let the experiment be tried—although rather, I confess, a cruel one for one set of birds—on two sets of fowls: let one be kept well, the other ill, for some time; reverse these, and see the marvellous difference. My mode of keeping hens has been condemned as extravagant, but I know this, that my birds were plumper for sale, and their eggs were larger, than some of those I knew of, who grudged the birds the plenteous food they required. The mode of feeding, and the material used, are as various as the breeds, almost, of poultry reared. Boiled potatoes mashed and mixed with bran I found to be an excellent food. But barley, ground coarsely in the mill, mixed with bean-meal and bran, the whole mashed up with boiling water, is possibly the best food I tried. Linseed-meal, mixed with shorts and sour milk forms a food promotive of laying. Beet-root is a food of which hens are very fond; it is said to be first-rate for laying. Oats soaked in water till soft, then fried or rather boiled in oil or fat, some say, is the best food possible to make hens lay in winter. Oleaginous seeds, as the

seed of sunflower or linseed, are also capital food during the winter months. All that can be said on the subject of food has been well said by Mrs. Blair,* in the work noticed below.

There is just one point to which I should refer in connection with the feeding of poultry, and that is, our experience is *not* in favour of the *continued* use of *cooked* food through the winter. As a rule, it should be given raw. One has only to try hens with the cooked and with the uncooked meat, to see which is the favourite with them. Their appetites soon pall with cooked, rarely so with uncooked, animal food. Such, at all events, has been one of the lessons of my farm. Mrs. Blair, in the work above alluded to, frequently refers to the importance of following the teachings of Nature in the treatment of hens; certainly, with reference to this question of cooked or uncooked food, Nature tells us which to give, for a female friend at my elbow mildly suggests "that Nature does *not* give to the hens, as they wander through the fields, in spring or summer time, a supply of *cooked* worms or grubs." No, truly! she gives them, as the French say, and as gourmands aver oysters should be eaten—namely, *au naturel*. The best way is to change the food occasionally, hence cooked may be made to alternate with uncooked food during the winter. Indeed, this alternation or rotation of food I conceive to be of the utmost importance. A variety of food is what the birds pick up in their natural state, and we should, in our artificial way of rearing them, endeavour also to give them this.

I have insisted upon cleanliness being the general feature of the dairy; it should in no less degree be the feature of the poultry house and its utensils. Let everything be kept truly clean. The drinking vessels must be kept clean and well supplied with fresh water. This

* "The Henwife—Her own Experience in Her own Poultry-Yard. By Mrs. Fergusson Blair, of Balthayock. Edinburgh: J. Jack." *We* have been so much indebted in the practice of our poultry-keeping to this valuable work, that I gladly avail myself of the opportunity to recommend it to my readers as one to be kept for daily reference. It is distinguished by its sound common-sense views.

supply cannot be too well attended to. Small dishes for water are better than large, as being soon emptied they *require* filling often; and each time they are filled a reminder is given to the henwife to see that, ere filling, they should be cleaned. None but a hopeless, helpless slattern will keep filling water into *dirty* vessels. Fowls should be allowed a run in the fields as often as possible—they enjoy this vastly; and pick up, during it, no small quantity of animal as well as vegetable food.

The best way to keep eggs for "setting" is to place their small end downwards in a basket, or a deepish dish, as a soup tureen, filled with perfectly dry bran. Each egg should have marked in pencil the date on which it is laid; and on placing the first eggs in the basket or dish, place them near one end, in a row, gradually and symmetrically filling it. As each egg is dated, selection for sitting purposes is an easy matter. If setting-eggs accumulate faster than there are brooding hens to set them with, and you wish to use the eggs, use the oldest. Be sure that your hens are *broody*. "Not every hen," remarks a judicious observer, "that rumples up her feathers and cluck, cluck, clucks with affected matronly indignation and importance, is fit for the great duty of bringing forth a brood. A good setting hen should be *large*. Size is important, because of the greater amount of warmth imparted to the eggs, as well as giving the hen the ability to cover the eggs thoroughly, and thus secure regular hatching. She should be *well-feathered*. If a hen which shows a desire for incubation has a meagre coat of feathers, try and get her out of the notion. If she will sit in spite of you, give her but a few eggs."

The form of the nest I found to be a matter of importance. Where this admits of the eggs being allowed to spread and be moved aside by the hen turning them, the chances are that some of the birds will not hatch through the eggs getting cold. The best nest I have found is what is called a "pan-basin" in Lancashire. This has a tapering form, and when the nest is formed in this of hay, it allows the eggs to lie close together, and the hen to sit well on them.

All setting-hens should be kept apart by themselves in a darkish and quiet apartment. If the other hens are allowed to fuss in and out, no satisfaction will be obtained in the hatching. As the confinement of the poor birds is long and tedious—twenty-one days for hen and twenty-eight for duck eggs—humanity, if not interest, demands that every thing should be done to make their confinement as pleasant as possible. To this end let their supplies of food and water be regularly attended to, and a dust-bath provided. When the hen is off for her daily exercise or food, the nest should be looked to, and broken eggs, if any, removed. As much as possible in the hatching of the eggs should be left to Nature; we had no luck with birds assisted out of their shells, nor should feeding them by hand or rearing them apart from their mother be attempted. Ducks make sometimes bad mothers—ours have invariably done so—and the little ducklings, in some instances, have had to be reared alone. Ducklings, however, are not so helpless or difficult to be reared by hand as chickens, and, in more instances than one, we have brought up ducklings left by cruel parents. Hens make the best mothers for ducks.

As to diseases of poultry, a book might be written on the subject, but with little practical good so far as amateur farmers are concerned. At first, all sick poultry we were troubled with we attempted to cure after the most improved or approved fashion, but the only result was that we tortured the poor birds and lost them in the long run. The truth is, we soon learnt the lesson that the cure of disease of ordinary fowls is not worth attempting; and that the best way out of sight was, as soon as I noticed a fowl drooping and looking miserable—as indeed a sick fowl looks so to perfection—I mercilessly, or rather mercifully, devoted it to the hands of the executioner. A fowl, even under the slightest sickness, deteriorates so fast in condition, that it is best to kill it at once. Since making this a rule in my poultry department, I have learned that it is the advice of an authority, "Better kill than attempt to cure."

CHAPTER XXXI.

THE PIG ON THE SMALL FARM.

We have got now to the management of the pig, that "Ishmaelite of the farmyard," as he has been termed. The question has often been asked, Do pigs pay? and, strange to say, it has been more frequently answered in the negative than in the positive, and the facts disputed which can be brought forward in proof of the positive answer. Those desirous to see the matter fully discussed are referred to the chapter on Swine in "The Complete Grazier."

Young and store pigs are comparatively easily fed in summer. There is a good deal of refuse matter from the house, butter-milk and whey from the dairy, and of grass food from the garden and fields, which keep them in a moderately-improving condition; this will be greatly helped on if they have a field or fields into which they can be turned daily. A vast deal of food can be there picked up, and the exercise is beneficial otherwise. But if the sun is hot, they must not be turned out till it is going down; for pigs have a tender skin, and an unprotected one, and they suffer much if exposed to strong sunlight. In the early months they will require to have cooked potatoes, roots, and kitchen refuse. Good dry bedding and clean sties, as well as clean bodies of the pigs themselves, are great helps in keeping them up to an improving standard. Some think differently, and even allow their young and store pigs to waddle in mud and all sorts of filth. They find out their mistake some day; and if they do not, the mistake and its losing consequences exist all the same.

It is such feeders who raise the cry, and believe in it, that pigs do not pay. The matter for surprise would be if they did under the circumstances.

When the pigs are sufficiently advanced so as to be getting ready for the butcher, the food must be increased in quality, and their condition kept gradually improving. To the ordinary food which they have hitherto been getting should be added, therefore, some nutritious substances, as meal, Indian corn, and a little artificial food of the best quality. Cinder or coals for all classes of pigs are essential to health; of the two coals are the best. Attention should be paid to the condition of the bowels, for if these be not attended to, and if they do not act regularly, the food is to a large extent thrown away; and indeed worse than this, for it only aggravates the mischief which is being done. When the pigs are getting nearly "ripe" for the butcher, they must be put upon forcing food for the last three or four weeks, in order to finish them off. The best food for this purpose is oatmeal varied with an occasional feed of Indian corn; this latter should be partially cooked, as in some cases, from its extreme hardness, it simply passes through the bowels without being dissolved and assimilated. A good, perhaps the best, plan of giving these finishing-off foods is to prepare them in the form of a warm, thick mash—not thin and watery—with good potatoes and a turnip or mangold or two. Salt should always be added. For drink they should have whey and butter-milk from the dairy.

The sows with pig and near their time should be kept wholly in the sty for some weeks before littering. They should be fed on warm and rather thinnish mashes of brewer's grains as a basis, and potatoes, meal, and pollard or bran. The bedding should be abundant in quantity and clean and dry.

In the winter management of pigs, the main object should be to have their sties kept regularly cleaned out, supplied with abundance of litter; good, clean, and dry leaves—which the boys of the farm should collect—and the withered fronds of ferns make capital bedding,

as does also sawdust; and these, when well saturated with liquid manure and mixed with the same, are worth a good deal in helping to keep up the fertility of the farm. But these materials, be it remembered, are not to be used as substitutes for, but merely supplementary to, the straw, without which the pigs cannot be comfortably bedded, but will suffer from cold, and that is equivalent to a loss of food. The young pigs who have to come through their first winter, and an experience quite new to them, require to be particularly well attended to in the matter of bedding. Their food should be such as to keep them in a gradually improving condition without having a tendency to force them. Both young and store pigs should have an occasional run in a field when the weather is mild and open.

Swine with litters of young pigs require great attention to be paid to them, both as regards food, of which the quality must be good, and the bedding. Many a good litter of pigs has been lost by their being fairly starved by cold. The pigs of every litter are rarely of equal size and strength, and there is generally one or two which, being larger and heavier, may be called the "master pigs," and these generally rule the denizens of the sty with a high hand, preventing the weaker pigs from getting their fair share of food. This ought to be looked to, otherwise it may be found some day that one or more of the weak pigs are dying from want of food; or, if matters do not go to this extremity, so far put back in condition and so injured in their constitution as never to be worth much. The same remark is applicable to young and store pigs.

CHAPTER XXXII.

RECORDS OF THE WORK OF A SMALL FARM.

"Let everything be done systematically and in order." An admirable maxim, and worthy of being kept always in remembrance, even on the smallest of small farms. It involves two points to be attended to—first, having a system; and secondly, the orderly carrying out of its details into practice. One may arrange the finest system of working out a business, but little practical result will be attained if it be not attended to. The value of a machine consists not in the mere possession of it—to be able to say, I have it—but in making it to do its work properly.

A great help in carrying out a system of orderly farm work is to keep a record or journal of it, and a set of books in which accounts can be kept. On a small farm these may be of a very simple and unpretentious character. My set consists of—(1) a Record of Farm Work; (2) a Farm Cash Book; (3) an Order Book; (4) a Receipt Book; (5) Milk Accounts; (6) Butter-making Book. The list, when thus written, appears somewhat formidable, I confess, and scarcely deserving of the title "unpretentious" which I have claimed for it. But, in reality, the "set" is a very simple affair, as will appear on a brief explanation of its parts. First, as to the Record of Farm Work. This is not a journal in which the daily doings of the farm are duly set down; but rather an occasional jotting-book, in which the principal operations of the farm are recorded. To keep a regular *Journal* would take up too much of the time of an amateur farmer, whom I presume to be occupied otherwise with his ordinary avocations. Besides, this daily record is not required ; as on many

days, especially in the winter season, the operations performed are of a very trivial character. As the Record of which I speak contains a list of all the operations of the farm—as, for instance, the date when you put in such a seed, and how you sowed it; manured such a plot, and what the nature of the manure was, and how you applied it; together with many other things needless to be mentioned here—it becomes, in process of time, an exceedingly interesting work—a map or chart, so to speak, in which you can trace your progress in times past; and from which you can make a series of comparative observations of extreme interest.

To aid in the drawing-up of this record, I would recommend all amateur farmers to plan out that part of the little farm which is devoted to arable culture. Thus, the diagram opposite may represent the outline of the part under culture, with the divisions occupied with various crops as marked. This I call the General Plan, which can be instantly referred to as defining the place of any specific crop. But, in addition to these, I have "detail plans" showing the way I set out each of those divisions. Thus, the "general plan" is placed at the beginning of my Record of Farm Work, while the "detail plans" come in at various places according to the season. I have already, in the chapter on Crops under Culture, given these "detail plans." I make the same plans and entries of the plots for extra crops and seed-beds in the Division No. 5 in General Plan, so that I can by inspection readily ascertain what seed I have sown, and when, where, and how. A few extracts from my Record of Farm Work will show the nature of the entries.

Nov. 5th.—Sowed, with wheat, butts Nos. 1, 2, 3 (see plan, page —), broadcast.

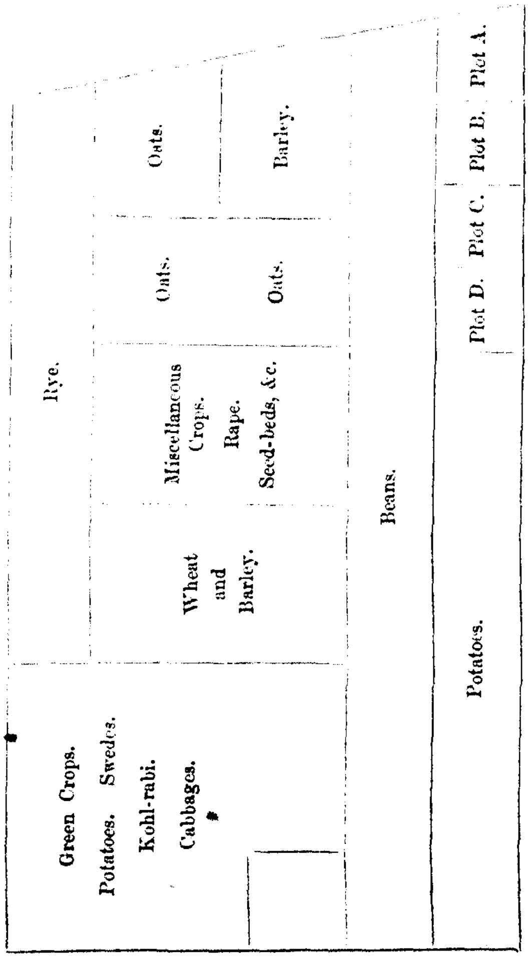
Nov. 6th.—Sowed, with wheat, butts Nos. 4, 5, 6, (see plan, page of Record Book —), in drills nine inches apart.

Nov. 6th.—Dibbled, with Sigma's dibble, butts Nos. 7, 8, 9. (See plan, p. —.)

Jan. 27th.—Top-dressed division No. 3, Long Meadow, with artificial manure composed of equal parts of

nitrate of soda, common salt, and wood-ashes, at the rate of 2¼ cwts. to the acre.

Feb. 26th.—Sowed, in division No. 3, general plan, butt No. 1, with beans, in rows three feet apart; the



GENERAL PLAN OF CULTIVATED LAND.

beans hand-dibbled nine inches apart. (See plan, p. —.)

Feb. 27th.—Hand-dibbled butt No. 4, with beans, as in plan, p. —; three feet intervals between the rows, four rows in each set, the beans dibbled in the rows nine inches apart.

March 2nd.—Sowed in seed-bed No. 1, in division No. 4, general plan, two ounces of drum-head cabbage, in drills nine inches apart. (For transplanting.)

Feb. 16th.—Top-dressed wheat, butts Nos. 1 (see plan, p. —), 4, 7, and 10, with nitrate of soda, and butts Nos. 2, 3, 6, 9, and 12, with a mixture of nitrate of soda and common salt; all at the rate of 2½ cwts. to the acre. Left butts Nos. 2, 5, 8, and 10 undressed. The words "plan" and "page" refer, of course, to the entries in your Record of Farm Work.

In order to ascertain the cost of preparing the land for the crops, the time which it takes a man, or two men, as the case may be, to dig a certain division, should be entered, noting also the time taken in sowing the seed, &c. The date should also be entered when you begin to use any particular kind of food, and the date you procure or begin to use a fresh supply; you have thus the means of ascertaining, which I have found more than once to be very useful, whether there is a careless use or otherwise of it during any given period, as compared with one that is past and recorded. So much for my Record of Farm Work Book.

My Farm Cash Book was a simple affair: on one side I set down, under its appropriate date, every item of cash expended; and on the other every item of cash received for milk, butter, and eggs sold, or for pasture right. My sales being of a very trifling nature, and being nearly all ready cash transactions, I had no need of a "ledger."

My Order Book and my Receipt Book were important. In the one I entered a correct copy of every order I sent out to tradesmen, for materials, with the date of its issue and the name of the party to whom it was sent. When the articles were received, I at once entered a correct copy of the invoice, with the date. I

thus had complete checks upon every item of my expenditure, and could tell at any time "what is what."

My Milk Accounts were two in number; one marked, "Milk obtained each Day," the other "Milk-selling Account." The latter was a statement of the milk sent out each morning and evening to the man who sells the milk I had to spare, after keeping what is considered necessary for the household wants, and for butter-making. The following shows the method I adopted of drawing up these accounts.

MILK OBTAINED EACH DAY.

Date.	Morning.			
	"Lily."		"Violet."	
	Quarts.	Pints.	Quarts.	Pints.
Oct. 16th .	8	—	9	1

The above is a form which I used when I wished to make comparative observations as to the milking of two cows, one of which was fed on one, the other on another system.

Date.	Morning.		Evening.	
	Quarts.	Pints.	Quarts.	Pints.
Oct. 27	8	0	8	0
,, 28	8	1	6	1
,, 29	7	1	6	1
,, 30	8	1	6	1
,, 31	8	0	7	0
Nov. 1	8	0	7	0
,, 2	7	0	7	0
,, 3	8	0	6	1½
,, 4	8	1	7	1
,, 5	7	1	6	1
,, 6	8	0	6	1
,, 7	7	1	6	1
,, 8	7	0	6	0
,, 9	7	0	6	0

The above is an extract showing a fortnight's milk from one cow. I give it also as illustrative of a fact which has long been noticed, that the produce of the morning milking is always more than that of the evening. Although it is rather troublesome, it is more satisfactory to keep the record of each single cow's milking as above. Where the trouble is grudged, the whole produce of all the cows can of course be easily entered. In addition to the interest acquired by keeping a record such as the above, some important uses are served by it. You can at once notice any falling off in the quantity of milk produced, and trace, or at all events try to trace, the cause. I found the milk record acted as a capital check on the doings of my cowman or dairymaid, and had more than once detected a carelessness and neglect in the feeding. You can, moreover, by its aid, note the effect of any peculiar style of feeding or treatment you may be trying; I not seldom falsified the prophecies of my cowman by its means, proving to him that the produce had not fallen off under certain treatment, which he said would be the case. Still farther, this milk record enables you at any time to ascertain, to the value of a penny, the amount which you have received in any one period from the cows; and this independently of, or rather acting as a check upon, your separate milk and butter account. The "Milk-selling Account" is, of course, drawn up in the same way as the above.

The Butter-making Account is also very useful and interesting. It is arranged as follows:—

Date.	Time occupied in churning till the butter comes, not including the collecting, working, &c.	Quantity of Cream employed.		Quantity of Milk afterings.		Weight of Butter obtained.	
		Quarts.	Pints.	Quarts.	Pints.	Lbs.	Ozs.

It is worth while to keep an account of the eggs

obtained each day; a slate is hung up in my kitchen, and as the eggs are brought in, the number is entered thereon. As many are used in the house, the cash obtained for eggs will give you no correct clue to the profits or loss of the poultry. At the end of each month, the figures on the slate are added up and entered in a book, with the selling price for the month attached. You can tell by such means whether or not it is truth or a quiet sneer at your "play-farming" when your friends assert that you are rearing eggs to eat at double, treble, or even quintuple the market prices; friends in such cases oddly enough, be it here quietly noted, not sticking at calculating trifles, or high-sounding sums.

All this, by many, doubtless will be called the dilettantism of farming accounts—mere play. I hold it, worthy reader, to be, in truth, nothing else than this myself, and wish it to be considered nothing else. All amateur farming must, some of it to a greater, some to a less extent, partake of the nature of amusement or recreation—play, in point of fact. And very healthy, honest play it affords, too; much better in every way than some kinds I wot of, where green-baized boards take the place of green fields; croupiers, that of cattle, and pigeons *to be plucked* hovering near. But I hold it to be an excellent rule, to endeavour to make the most of everything, to extract, so to speak, as much of the honey from every flower you light upon as you can—and that whether you are engaged in work or play, it is best to be hearty in the pursuit. That which thy hand findeth to do, let it be done with *all* thy might. So that, if you make up your mind to try a little play-farming, as I have done, do as I did, and try and get as much pleasure as you can out of it. And the more intellectual the pleasure is, the more lasting and worthy of your regards you will find it. And this intellectuality you will best secure by endeavouring to know the why and the wherefore of everything. I do not say that all this "finical, ficky style of recording," as some will, doubtless, call it, will secure this; but I do say, that it will go some considerable length in enabling

you to do so; and that is a promise worth something, and one which, if you try it, will be redeemed in some small, perhaps in large, measure. And in the case of the small farmer who farms for a living, books of some kind are simply essential.

I have already enlarged upon the pleasures to be derived from cultivating a wide variety of crops. The amateur farmer should, however, recollect that the advice given on this point is to be taken with a reservation. For, as I have already stated, farming, as practised in Great Britain, is characterized by numerous diversities, and what to many appear extraordinary contradictions. These, however, arise from the diversity of soil and climate, and the peculiarities of locality; so that in forming a plan or scheme of agriculture, the amateur farmer, as well as he who farms for profit, must not overlook the peculiar nature of the soil which forms the arable part of his farm, or the relation which its physical condition has to the nature of certain vegetables he proposes to grow upon it. The kind of soil to be looked for by the amateur farmer is the "dark rich mould which forms the most fertile soil," and which is produced naturally by the fermentation or action of animal and vegetable substances upon it.

Rich mould of this kind possesses all the requisites essential to the growth and perfection of farm crops. And where it does not naturally exist, it is satisfactory to know that by superior modes of working and treatment, even comparatively bad soil can be changed so as to possess most, if not all, the properties of this class of soil. Good farming can change the character of a soil so as to make it bear either more luxuriant crops of the plants which it is best fitted naturally to bear, or plants of another and a different kind. Changes of this nature are brought about by the various processes of improved farming; by drainage, ploughing, sub-soiling, harrowing, crushing, and by manuring and clearing the soil. All this requires time and patience, and the amateur farmer must ever be careful to remember, that danger is apt to arise from an over-hasty determina-

tion to introduce new methods of working, or to improve the soil and increase its produce, by modes foreign to the locality. The results of agricultural experience or practice of any locality are not lightly to be set aside, however captivating or reasonable the dicta of theory, or new-fashioned modes of working may be. "Little by little" is a good motto for the amateur farmer, who is apt to be somewhat enthusiastic in the matter of introducing new things. Novelty does not always bring with it efficiency, no more than old things carry with them perfection: the happy medium frequently is found to lie between the two; and more especially in farming is this true. As a rule, it may be accepted that where certain modes of working are found to prevail in a district, that good reasons exist why these should be followed. And it is exceedingly dangerous to pronounce them essentially wrong simply because they may run contrary to the rules by which we have been guided, or to the methods which we have been in the habit of adopting. Agriculture is not, in the ordinary acceptation of the term, a "fixed" science; there is no such thing yet as an agricultural theory adapted to all varieties of practice; there are so many peculiarities tending to throw in disturbing elements, that the dictates of theory, however applicable to one locality, are found to be totally inapplicable to another. Hence the danger which arises to the real progress of agriculture from the facility with which some accept new notions, simply because they are new, and endeavour to make them applicable to all circumstances of soil, climate, and locality; and hence, also, the reason why—a fact which is extremely puzzling to many—farmers who have been invariably successful in all their operations in one locality should so signally and totally fail in another, to which, in fact, they have often *emigrated* — so to speak — to introduce what they have been pleased to term the "new lights" into darkened districts.

A judicious amateur farmer, then, should strive "to keep his lands always in good cultivation rather

than suddenly make them much better, lest a few years should convince him that he was in reality doing almost irreparable mischief, while he fancied himself making improvements." It is always flattering to us to think that we are doing better than our neighbours; but it is well, at times, to ascertain *what* our neighbours are doing, and to endeavour, if possible, to trace the reason *why* they are doing so; it will go hard if we do not derive from this inquiry some lesson of worth.

CHAPTER XXXIII.

MONTHLY MEMORANDA OF FIELD-WORK.

JANUARY.

"Now the frozened soil is hardened into rock;
Broad waters are bridged o'er with ice, and bear
The heavy waggon; and a sportive throng
That to and fro glide rapidly along.
Home now has charms untold, and numbers flock
Round the big fire that blazes everywhere."

THE out-door labour of the farm will consist principally in carting or wheeling manure on to the fields, this being done best in time of frost; in preparing compost-heaps; in repairing fences, drains, &c.; and in ploughing or digging when the weather is open and suitable.

The manure taken to the fields may be spread on the land as the heaps are formed. Artificial manures may also be spread on the meadow-fields, care being taken to do this as uniformly as possible.

The management and treatment of compost-heaps is a matter of the utmost importance. Where the cleanings of ditches, road-scrapings, &c., &c. are collected—and they *should* be collected whenever opportunity offers—lime should be mixed with them. When the compost-heap is turned over it will be advisable to add some salt to it.

Generally speaking, the weather precludes much digging or ploughing being carried on. If you have not been fortunate enough to get all your plots which last year carried grain crops—and which, tech-

nically, are known as "stubble-lands"—dug over in the autumn months, take advantage of seasonable weather to go on with the digging now. The surface should be left rather rough than smooth, in order to get the action on the soil of such frosts as will likely yet set in. Turnip land—that is, land which last year bore turnips—should also, if opportunity offers, be dug over for the cereal crop.

The crops which may be sown this month are wheat, barley, oats, and tares or vetches, and beans. In sowing wheat, the land should be moist, but not wet, and any of the winter wheats may be put in. Talavera is a good sort. As a rule early varieties grown in early districts should be sown—Fenton's, Archer's Prolific, and white wheat with red chaff; Hunter's and Brodie's are varieties which may be named here. I have given remarks in the text on the *mixture* of wheat for sowing; it is right here, however, to state that this system of mixing is not held in esteem by many authorities. These hold, in fact, that this is not one of the practices of scientific agriculture, and that wheat of one variety should alone be used.

Barley and oats are sometimes, in very favourable districts, sown this month; but the sowing of the former had better be delayed till a later period. It is worthy of remark, however, that oats sown early have produced remarkably good crops. Four plots may be put down for this crop—two sown in this month, two sown at a later period, and the results tabulated at the proper season.

Tares or vetches may be sown for spring cutting as cattle food. With these a quantity of oats should be sown, in the proportion of two of oats to one of tares; four bushels of the mixture being given to each acre. Beans, if the plot in which they are to be grown is dry, may be sown this month. Any of the common field sorts may be chosen.

FEBRUARY.

> "Blue-eyed spring is struggling into life,
> And feebly laughs, and lisps her earliest words;
> The snowdrop peeps, the voice of singing birds
> Is heard again."

Ploughing and digging should be proceeded with whenever the weather permits. Heavy clay soil should never be touched till it is in a dry state. To turn it over when saturated with wet is a great mistake, as the soil gets hardened or baked into obstinate lumps.

Barley and oats may be sown now in dry soils. It is worthy of note that early sowing is getting every year more and more into favour. Wheat may also be put in if the soil and weather are favourable; care should be taken not to over-harrow the surface, but to leave it rather rough than otherwise. The quantity of seed (see text) should be increased in sowing this month.

Beans should now be got in if possible, as when sown later than this month the yield is not so satisfactory. The soil best adapted for the bean crop is a calcareous clay. Heavy soils are better than light. I have in the text given some remarks on the culture of beans; and, in the autumn *months* of this calendar will be found a description of the mode of preparing the land for this crop. Beans should be either drilled or dibbled. In cases where time did not permit of the land being manured in winter, the manure should be applied now, throwing up the land in ridges or furrows, and spreading the manure in the rows. The beans are then to be drilled or dibbled in, and the soil turned over them by splitting the ridge with the double mould-board plough, or throwing the soil of the ridge right and left by means of the spade. It may be mentioned here that the richer qualities of dung may be retained for the other crops, the bean crop doing well with manure of an inferior quality; further, that artificial manures, as guano, &c., are of comparatively little service to the bean crop. Of the varieties which may be grown I name the *common tick*, a prolific bean, much grown, and

of which two bushels may be sown per acre; the *winter* bean, *common horse* bean, and *Heligoland*. The *long-pod*, or garden bean, is now recommended by some as a good crop for farm purposes. Bean-straw, it may be noticed here, cut up and made to form part of a mash, is good food for dairy cows. Mr. Horsfall, in his now celebrated system of "Dairy Management," gives a high place to bean-meal as a feeding material.

MARCH.

"March of the gusty breath."

"Hour after hour, and day to day succeeds,
Till every clod and deep-drawn furrow spreads
To crumbling mould! a level surface clear,
And strewed with corn to crown the rising year."
Bloomfield.

The sowing of the cereals and the leguminous crops—as the beans and peas—should be pushed on, so as to admit of time being devoted at an early period to the preparation of the land for the root crops.

Where any stubble-land yet remains to be dug over, care should be taken not to commence operations till the land is in the best possible condition; it is better to delay till this can be secured than to proceed with operations when the soil is in bad condition.

The sowing of wheat should be completed this month, Talavera or April wheat being selected.

In selecting seed for the oat crops, take care to procure it from an early district. Let it be a true variety, and free from the seeds of weeds. These two essentials can only be secured by dealing with respectable seedsmen. The varieties of oats grown are very numerous.

The sowing of barley should also be proceeded with. The variety known as the Chevalier is the most highly thought of. Seed should be selected from samples grown in early districts.

Cabbages and kohl-rabi should be sown in seed-

beds this month. The soil of these should be in rich condition, and brought to a fine tilth. The seed should be sown in rows or drills nine inches apart, and the whole kept free from weeds.

Getting in the potato crop is one of the most important operations of this month.

Artificial manures should be purchased at the beginning of this month. There can be no doubt as to the advantage of applying these liberally to the various crops. And on this point I cannot do better than refer to the published remarks of Mr. J. B. Lawes, than whom no better authority on manures exists.

APRIL.

"Lo! the full march of spring."

"Scant along the ridgy land
The beans their new-born ranks expand;
The fresh-turned soil with tender blades
Thinly the sprouting barley shades."

Continue the digging, ploughing, and cleaning of land for the turnip crop. Hoe between the rows of wheat and beans, to stir the soil and get rid of weeds. About the end of the month commence the sowing of mangold-wurzel. After the manure is spread between the furrows or on the flat, broadcast over the manure superphosphate or other artificial manure, taking care to mix with it a proportion of common salt, splitting the ridges to cover the manure, and mix with the artificial. Carrots may be sown in land in good condition, finely pulverised, and manurially rich. The seed should be mixed with sand, to enable it to be sown easily. The distance between the rows eighteen inches. Five pounds of seed per acre will be sufficient. To enable early hoeing of the crop to be begun, it is advisable to sow turnip seed along with the carrot seed. This sprouting first will enable the line of carrots to be

traced. Early hoeing of the carrot crop saves much labour at future stages.

Finish the sowing of barley and oats. Consolidate the land where wheat is sown by passing the roller over it. If the growth of this cereal is too luxuriant, eat it down with sheep, or cut it for cattle-soiling. Put in a breadth of spring tares, or vetches, or rye, to be cut down green in the autumn for cattle-soiling. Finish the planting of potatoes.

MAY.

"The bloom is on the bud, and the bird is on the bough."

"A balmy briskness comes upon the breeze."

The great work of the latter end of this and the beginning of the next month is getting in the turnip crop. For my remarks on the work of this, see the text.

Hoe and weed the wheat, barley, and oat plots. Also hoe between the rows and hand-weed beans, carrots, and potatoes.

Transplant cabbages and kohl-rabi to land highly manured, both of these crops being greedy of manure.

Let the hoeing, weeding, and clearing of the crops be most diligently pursued. Early work in this department of farm labour will be easy work. "One year's seeding is seven years' weeding." Remember this, and wage unceasing warfare with the weeds.

JUNE.

"Gladly the blithe mower cuts his sounding way."

"When the fresh Spring in all her state is crowned."

Finish turnip sowing. Single or thin out those sown last month, and which are now sufficiently ad-

vanced. Hand-hoe and weed between the rows of mangold-wurzel. Single carrots; hoe and weed the cereal plots, beans, &c.

The important labour of the month in advanced districts is haymaking. As soon as the crop is off the fields, top-dress for the second crop, or aftermath (see text).

JULY.

"Clover blooms white o'er the lea."

Haymaking will be proceeded with, and should be finished this month. Keep up the warfare against the weeds. Winter beans will be ready in some districts for reaping. Sow rape for transplanting in October, to be cut as green food next spring. Hoe and weed the turnip, mangold, and cabbage plots.

AUGUST.

"Oh, beautiful the picture, from that steep
Of fields of yellow corn, that ripening sleep
In the warm sun, all golden with his light!
Gaze! as the month advances—gaze again
Upon that glowing landscape, and the crowd
Of white skirts gleaming in the ruddy grain.
How beautiful the scene! And oh, the loud
And spirit-stirring shout of 'Harvest home!'
That peals upon the breeze while on our way we roam."

Harvesting the cereals is the important labour of this month. As soon as the grain is *ready* lose no time in stacking it. The stack, not the field, is the place for it. Oats should be cut before they have lost the greenness of the straw; wheat should be cut before it is dead ripe; and barley should not be cut till it is dead ripe, indicated by the drooping of the head. Continue to hoe and weed the turnips. Mangolds and carrots seeding should be lifted and given to the pigs.

Early stubble land may be sown with white turnips for autumn feeding of stock. Mustard may be sown to be ploughed in as green manure. Winter tares should be sown for cutting for green food in spring.

SEPTEMBER.

> "Now
> Autumn has swept her pencil o'er the trees,
> And left a golden stain."

Autumn cultivation of stubbles should, if possible, be proceeded with. By adopting this system, much labour is saved in spring, when time is precious and the weather precarious. Harvesting of the cereals is continued, if not finished last month. Early plots of fine samples of wheat—as of Hallett's Pedigree—should be dibbled in this month, and winter rye and vetches for spring feeding sown broadcast or in drills. Pastures should be top-dressed with dissolved bones, phospho-Peruvian guano, or with farm-yard manure.

OCTOBER.

> "Stroll down the leaf-strewn lane, and on some stile,
> Hacked with the rustic's knife, seat ye awhile,
> And watch the husbandman diffuse his seed
> Over the ruddy field. 'Tis sweet to me.
> The berried hedgerow, and the yellow tree
> Have charms as yet, though flowers and leaves be dead."

Sow wheat (see text) and winter beans.

Getting up the potatoes is the most important operation of this month. As they are carted or taken from the field, get them housed or pitted without delay. Let the pits be perfectly dry, well thatched, and have a drain or channel cut all round, to prevent the water stagnating round the pit. If time will permit, it will

be in every way advisable to separate the diseased from the sound potatoes before storing them up.

Plots intended for mangold-wurzel, carrots, and spring beans should be turned over and manured this month, if time and weather will permit. All land dug or ploughed in autumn should be left rough, for the winter frosts to act upon the surface, and reduce the clods, &c. to a fine tilth. Top-dress meadows with farm-yard manure. This operation is most beneficial, more especially where young grass is coming up. This is sheltered by the manure from the cutting winds and frosts.

NOVEMBER.

"The trees are near undressed, and every gale
Thins the sere brotherhood of leaves that cling—
Last of their race—to the grey twigs, and sing
Their latest songs with melancholy wail.
Cold rain and sleet, and the round pattering hail
Drive through the gorges of the hills, and sweep
Across its plains, while blinded cattle creep
'Neath the tall hedge or mossy thicket pale."

The pulling up and storing away of the turnips and mangolds are now vigorously proceeded with. In topping, great care should be taken not to cut or injure the bulbs.

As the turnips, mangolds, and cabbages are cleared off, get the land speedily prepared for wheat, which sow in somewhat greater quantity than for last month. Carrots should be taken up. Kohl-rabi may be left in the field and taken up as required.

Plough or dig the stubbles, preparing those required for beans first, those for mangolds the second, and those for the turnips last.

DECEMBER.

"The fields are emptied of the sweet-breathed kine;
The woods are shelterless."

Continue the preparation of the stubble-plots for spring crops.

Although wheat-sowing is sometimes done this month, still, unless the land is in very good condition, it will be better to delay till spring, as many risks are run. If sowing is done, sow the maximum quantity, and leave the surface rough. Protect the rising plants of wheat from birds. Proceed with repairing the fences, roads, cleaning out the drains, &c., &c., and make all snug and tidy about the out-buildings. In frosty weather, cart out manure to the fields, and in rainy, thresh out the grain and look after in-door work.

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